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TESTED IN THIS ISSUE:

Norton Internet Security 2000

8 E-Mail Publishing Services

7 650-MHz Notebooks with SpeedStep

The Coolest 1-GHz Desktop PC

9 Network-Attached Storage Servers

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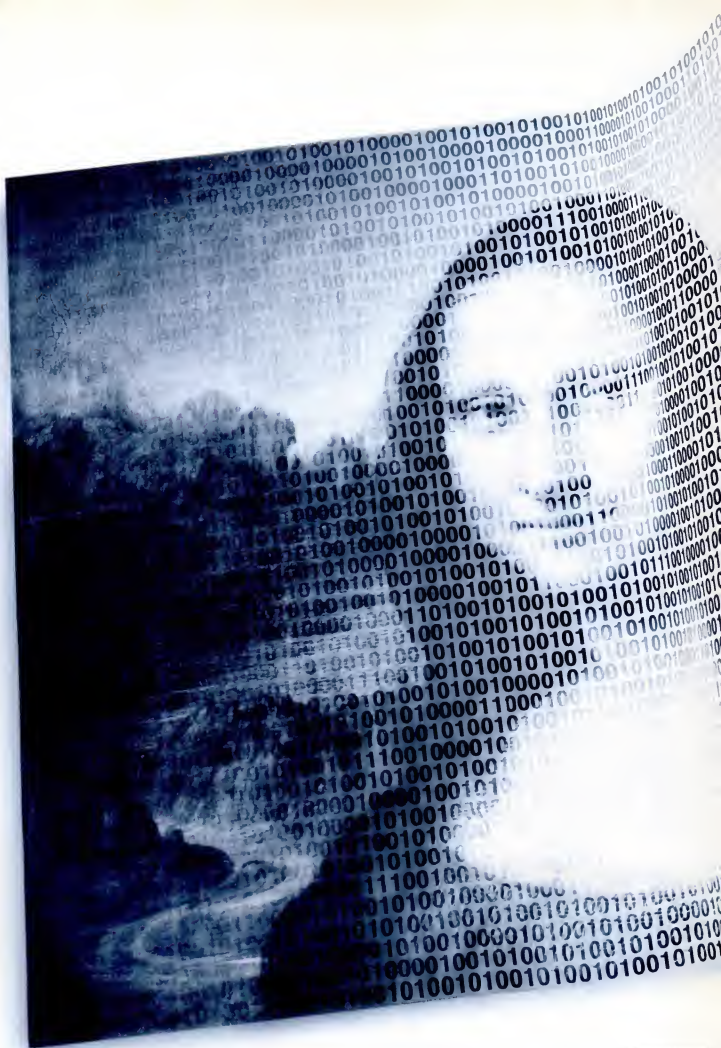
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Forward Thinking



HEY, AOL, YOU'VE GOT TIME WARNER!

ANY DOUBTS THAT THE INTERNET economy has taken over the economy as a whole vanished on January 10, when we watched AOL's Steve Case embrace Time Warner's Gerald Levin. The deal is an amazing one: America Online, which was a relatively small company only a few years ago, is swallowing a media giant.

Time Warner is the nation's largest magazine publisher and a leading producer of movies, music, and television, owning Warner Brothers, the WB Network, CNN, HBO, TBS, and much more. Just as important to AOL is the fact that Time Warner is the nation's second-largest cable provider, with a dominant position in cable access in most of the markets it serves. This deal will allow those 13 million cable subscribers to get AOL over cable much more easily.

This megadeal follows others in which AOL acquired ICQ, the leader in Internet messaging; Netscape, the leading browser vendor at the time; and CompuServe, another

grand old online brand. As a result, AOL became the leading provider of Internet access, pioneering \$400 rebates on computers for customers ready to make three-year Internet-access commitments.

Give AOL lots of credit: While the techies scoffed, it focused on access for mainstream consumers, and this worked: AOL now has 20 million subscribers, an order of magnitude above any other provider.

The deal will let AOL use content from the Time Warner media properties and gain access through Time Warner cable; the merger probably presages other combinations of tech companies and media giants we'll see in the months ahead. As consumers, our main job now is to insist that the new AOL Time Warner continue to push for open access to content and services from all providers, something AOL has long advocated but Time Warner has opposed.



A CHANGE AT THE TOP



THREE DAYS AFTER the AOL Time Warner news, Bill Gates announced that he would step down as CEO of Microsoft and hand the title to Steve Ballmer, Microsoft's president and long-time number-two

leader. The administrative change was presented as evolutionary; Gates is staying on as chairman, and Ballmer had assumed the president's role in the summer of 1998.

More interesting to me was the news that Gates was taking on a new role as "chief software architect," charged with creating what was termed "next-generation Windows services." At this point there's no detailed plan, but the goal is to integrate PC clients, servers, and Internet services to make writing Internet applications and accessing them from PCs and other devices easier. The idea would be to create Web sites and appliances that understand the information on other sites and to integrate new technologies from XML to voice recognition further.

One example: When a flight is delayed, other systems down the line, such as those at hotels and car rental agen-

cies, would automatically process the news, and everyone affected would be notified via their favorite Web-connected devices. This is a cool idea, but it's several years off.

Meanwhile, leaks out of Washington say that some states as well as the Department of Justice want to break Microsoft up into multiple parts, perhaps splitting up the operating system, applications, and online aspects of the company. Microsoft vehemently opposes such a deal, arguing that it can best serve consumers by integrating the operating system, applications, and Internet services. My guess is the two sides will be fighting over this for years.

If Gates and Microsoft can succeed in creating a new platform that does all the things they are talking about, it will create a new way of working that could be both interesting and scary at the same time.

One thing is clear: The Gates move shows that Microsoft knows it needs to change in the Internet world. The PC, which it has dominated for years, will continue to play a big role as the major tool for content creation and as a major access device, but other devices, servers, and services will become more and more important. And in that world, Windows faces big challenges from Internet standards and from the hundreds of new companies supporting them—competitors like IBM, Sun, and Linux companies—not to mention the new AOL Time Warner.

WINDOWS 2000: WHO SHOULD (AND SHOULDN'T) CARE

THIS ISSUE'S COVER STORY is our evaluation of the shipping version of Windows 2000, Microsoft's most ambitious operating-system upgrade in years.

I've been running Windows 2000 in various prerelease versions for quite some time now, and there's a lot to like in it. For a business user, it provides a comfortable interface with a few minor tweaks, mostly for stability and compatibility with peripherals like USB devices. For a corporate manager, it provides better manageability, easier deployment of new systems, and more scalability. Features like Active Directory and better clustering make it a natural in server environments.

Windows 2000 isn't for everyone. Recently, I was asked whether upgrading to Windows 2000 would make games run faster. Sorry, but no. In fact, it's a not good home-PC operating system at all. Although more games now work in Windows 2000 than in earlier versions of Windows (thanks

to DirectX support), many Windows games still write directly to the hardware and won't run under Windows 2000.

The biggest issue is the difficulty of upgrading from Windows 98 to Windows 2000. For most people, here's one word of advice: Don't. Despite the features that make Windows 2000 attractive, you'll need to replace your utilities, find Windows 2000 versions of many of your hardware drivers, and reinstall a lot of software. You're better off wiping the disk and starting clean with new drivers and compatible applications or getting a new system.

Windows 2000 is very important. Some will say that it isn't as relevant now as it would have been had it shipped a year or two ago, when it was first expected, and I agree that it isn't going to get the fanfare it would have gotten then. But when I recently asked a group of corporate IT managers what operating systems they expected to be using in five years, the one they mentioned most was Windows 2000.

AN INTERFACE OF A DIFFERENT COLOR

WINDOWS 2000's user interface isn't very different from Windows NT 4's, but I did see one interface upgrade recently that's a big departure from the past: Apple's new Aqua interface, which the company announced recently as a part of OS X, the long-awaited upgrade to the Macintosh operating system. (Long-awaited is the right word: It will be the first multithreaded version of the Mac OS, a version Apple's been promising for 13 years.)

Aqua builds on the basic features of the Macintosh, adding a dock at the bottom for frequently used applications, transparency of windows, and dialog boxes that attach to the top of windows so you don't get confused about which applications they go with. There are a bunch of lit-



tle changes, and the result is a more polished user interface than anything you're used to seeing today.

Underneath that interface are all the modern OS features, based on a Mach kernel. If you know where to look, you'll even find a Unix command line. Apple now expects to ship OS X in the summer, and it will be preinstalled on systems early next year.

Aqua may still be several months off, but it points up the tremendous possibilities of using today's faster PCs to create different kinds of user experiences. Another company that has been doing similar things is Be, with an OS designed for a world of streaming multimedia. In comparison, the changes in the Windows user interface look boring.

Y2K: LESSONS LEARNED



SO WE MADE IT THROUGH the turn of the century without The World As We Know It coming to an end. Y2K didn't bring the power outages, bank failures, and other assorted disasters that the Y2K doomsayers predicted.

You'd think that would make everyone happy, right? Of course not. Now I'm hearing from people who think the whole Y2K thing was a scam and hearing people complain that a lot of money was spent unnecessarily. Some are even talking about shareholder lawsuits against firms that spent a lot of money on Y2K remediation. I suppose you'd expect that to happen.

But are they right? My answer is an emphatic no.

I never bought into the hysteria of the Y2K Cassandra, but that doesn't mean there was no need to do anything. Most large and medium-size companies spent a fair amount of time and money correcting Y2K glitches, and if they had not, there would have been many more problems. Consider those Y2K glitches that have been reported, from incorrect bank statements to a "minor" accidental missile launch.

At almost every firm I've checked in with, a variety of little problems have turned up. Most companies aren't publicizing them, because they don't want to look silly.

The good news is that most made it through with minimal problems, and the better news is that many companies used the opportunity to gain new understanding of their systems and to move themselves into the Internet age.

As I said in a column last year, "Y2K is good for you."



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32 First Looks

- [32 650-MHz Notebooks with SpeedStep](#)
- [48 NetObjects Fusion 5.0](#)
- [48 Norton Internet Security 2000](#)
- [50 SYS Cold-Fusion 1000](#)
- [52 Siemens PocketReader](#)
- [52 WizCom QuickLink Pen](#)
- [52 Samsung SyncMaster 150MP](#)
- [54 Creative Labs 3D Blaster Annihilator Pro](#)
- [54 Hercules 3D Prophet DDR-DVI](#)
- [57 Visio 2000 Enterprise Edition](#)
- [57 Network Inspector 4.0](#)
- [58 Tektronix Phaser 850DX](#)
- [58 HP LaserJet 3150](#)
- [58 DPWeb](#)
- [60 EchoStar DishPlayer 500 with Microsoft WebTV Personal TV Service](#)
- [62 Inside PC Labs](#)

73 Pipeline

- [73 Digital photography develops online](#)
- [73 The outlook for IT hiring looks rosy](#)
- [74 Personal firewalls made easy](#)
- [74 Got an idea? Auction it over the Web](#)
- [76 Free Web-access services gain momentum](#)
- [78 Sega and Sony: The battle of the game consoles](#)

85 Solutions

- [86 Office: Create company logos using the WordArt utility in Microsoft Publisher and Word.](#)
- [89 Internet: Remote-control your PC over the Internet whether someone is there to help you or not.](#)
- [93 Desktop: Use command line options to customize Windows Explorer so that it launches how and where you want it to launch.](#)
- [95 Hardware: Most buyers overlook the BIOS when they're buying new PCs. Here's what you should look for.](#)
- [97 PC Tech: The latest version of IIS, in Windows 2000, is an evolutionary advance in power and ease of use.](#)
- [99 Utilities: CookieCop lets you decide which sites can leave cookies on your disk.](#)

Opinions

- [7 Michael J. Miller](#)
- [76 Jake Kirchner](#)
- [100 Bill Machrone](#)
- [103 John C. Dvorak](#)
- [105 John C. Dvorak's Inside Track](#)
- [107 Jim Seymour](#)
- [109 Bill Howard](#)

On the Cover

- Norton Internet Security 2000 [page 48](#) ■ 8 E-Mail Publishing Services [page 135](#)
- 7 650-MHz Notebooks with SpeedStep [page 32](#) ■ The Coolest 1-GHz Desktop PC [page 50](#)
- 9 Network-Attached Storage Servers [page 148](#) ■ The Latest Tax Software Upgrades [page 190](#)



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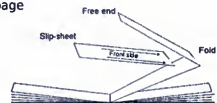
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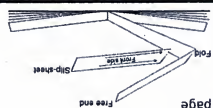


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COVER STORY

116 Microsoft Windows 2000

 After more than a year of delays and name changes, Windows 2000 is finally here. Was it worth the wait? PC Magazine Labs has tested the new operating system inside and out, and we have clear recommendations about who should and who should not upgrade.


INTERNET SERVICES

135 E-Mail Publishing

 You may have the best site on the Web, but why wait for people to come to you to get your message? E-mail publishing is a powerful tool for reaching your audience. We look at eight services that help you stay in touch.

HARDWARE

148 Stretch Your Storage

 Looking for a simple way to boost your network's storage capacity? Network-attached storage servers are an affordable, easy-to-implement solution. We review nine NAS devices and let you know which is best for your office environment.

AFTER HOURS

190 Computing Your Taxes

 Is it that time of year already? We review the newest tax software.

KEY PRODUCTS REVIEWED IN THIS ISSUE

FIRST LOOKS: 650-MHz NOTEBOOKS

- 33 Compaq Prosignia 170
- 34 Dell Latitude CPx
- 34 HP OmniBook 4150
- 36 IBM ThinkPad 600X 5FU
- 36 Compaq Presario 1800-XL
- 40 Dell Inspiron 7500
- 45 Gateway Solo 9300XL

E-MAIL PUBLISHING

- 137 eGroups
- 138 EnvoyMail
- 138 ListPlex
- 139 Microsoft bCentral's ListBot
- 140 PostMaster General
- 144 SparkList
- 144 Topica
- 145 UnityMail Express

STRETCH YOUR STORAGE

- 151 HP SureStore HD Server 4000
- 151 Intel InBusiness Storage Station
- 151 Maxtor MaxAttach 72
- 152 Linksys Instant GigaDrive
- 154 NetGear Network Disk Drive ND520
- 162 NSS µStor iU
- 166 Procom NetForce 100
- 166 Quantum Snap Server
- 168 SciNet Blazer

AFTER HOURS: COMPUTING YOUR TAXES

- 190 Kiplinger TaxCut Deluxe Multimedia
- 191 Microsoft TaxSaver Federal Deluxe
- 191 Quicken TurboTax
- 192 TaxACT '99 Deluxe

AFTER HOURS: QUICK CLIPS

- 191 Unreal Tournament
- 191 Quake III Arena
- 191 Midnight Play
- 192 Microsoft Links LS 2000
- 192 Compton's Learning Astronomy
- 192 Encarta Africana 2000
- 192 Who Wants to Be a Millionaire

ALSO IN THIS ISSUE

- 31 Lab Tales
- 65 Feedback
- 111 Sitefinder

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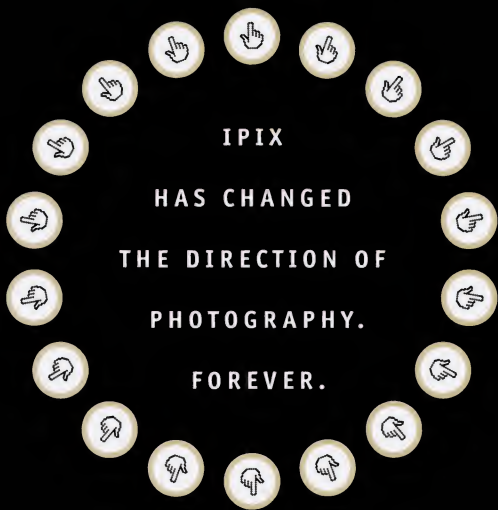
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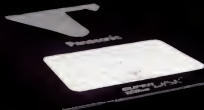
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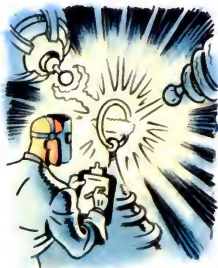
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FIRST

HANDS-ON TESTING OF NEW PRODUCTS

48 NetObjects Fusion 5.0
48 Norton Internet Security 2000
50 SYS Cold-Fusion 1000
52 Siemens PocketReader
52 WizCom QuickLink Pen

52 Samsung SyncMaster 150MP
54 Creative Labs 3D Blaster
Annihilator Pro
54 Hercules 3D Prophet DDR-DVI



57 Visio 2000 Enterprise Edition
57 Network Inspector 4.0
58 Tektronix Phaser 850DX
58 HP LaserJet 3150
58 DPWeb

A Step Up to 650 MHz BY CAROL VENEZIA AND CADE METZ

THE MAGAZINE
WORLD'S LARGEST
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Sometimes the best inventions are the simplest ones. Such describes the latest advancement in mobile processors from Intel. Imagine if your notebook PC ran as fast as a desktop machine when plugged into

an AC outlet but also had the ability to run at a slower speed when you were away from the wall outlet, to help stretch battery life. That is precisely what Intel SpeedStep does.

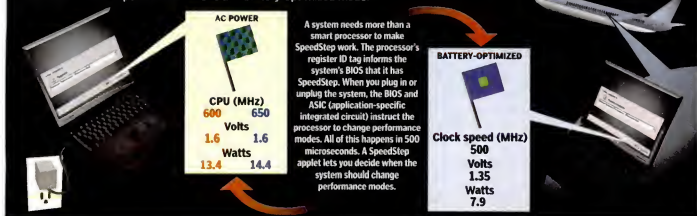
Code-named Geyserville, SpeedStep is part of two new mobile Pentium III processors running at 600 and 650 MHz. Before SpeedStep, Intel's fastest mobile processor was the PIII/500 (First Looks, December 1, 1999). Like existing Mobile PIIs, these CPUs are manufactured on a 0.18-micron process, have 256K of

on-die Advanced Transfer (L2) cache, and use a 100-MHz front-side bus. But the really big news is the SpeedStep technology, which essentially gives your PC a split personality, depending on whether you are on AC or battery power.

For our first glimpse at SpeedStep, we tested seven notebook PCs. Each came equipped with a 650-MHz Pentium III processor, 128MB of RAM, and Microsoft Windows 98. Four of the systems fall into the thin and light category (two-spindle systems weighing less than 7 pounds without an AC adapter); the other three are desktop replacements (three-spindle systems weighing 7.5 to 9.5 pounds). The thin and light notebooks are ideally suited for SpeedStep because they combine the performance of a desktop replacement with a package that is designed for frequent fliers.

How SpeedStep Works

Pentium IIIs with SpeedStep use dynamic frequency and voltage switching. This process lets the CPU switch back and forth between maximum-performance mode and battery-optimized mode.



L O O K S

- 60 EchoStar Dish Player 500
with Microsoft WebTV
Personal TV Service
62 Inside PC Labs



REVIEWS ONLINE: RealNetworks' RealServer 7, askSam Systems SurfSaver 2.0, Olympus Eye-Trek Play's Snappy Video Snapshot 4.0, iNLine Global's Modern Booster 1.0



As we expected, prices for these notebooks can go quite far north of \$3,000. The bargain of the group is the Compaq Presario 1800-XL, a fixed three-spindle machine with a street price of just \$3,200. At the other end of the spectrum is the Dell Inspiron 7500, a \$4,606 (direct) desktop replacement. These SpeedStep systems currently cost \$100 more than identically equipped PIII/500 notebooks, but this margin will increase in coming months as Intel drops prices on the 500-MHz chip.

THE SPEEDSTEP STORY

To the end user, SpeedStep is nearly invisible. In fact, if it weren't for a new icon in the System Tray, you might not even notice it. But behind the scenes, there's a lot going on to give you a better balance between power and battery life.

When you unplug or plug in a SpeedStep notebook, the system performs what Intel refers to as *dynamic frequency and voltage switching*. In layman's terms, this means that the CPU switches between a high-performance mode on AC power (600 or 650 MHz, 1.6 volts, 13.4 or 14.4 watts) and a battery-optimized mode (500-MHz, 1.35 volts, 7.9 watts).

The key to SpeedStep is that all of this switching happens automatically in the background—and in less time than it takes to blink your eye.

Intel has wisely chosen to make SpeedStep as unobtrusive as possible. A small flag icon in

the System Tray indicates the mode in which you are operating. By default, SpeedStep systems are set to run in Maximum Performance Mode when on AC power and battery-optimized mode when the unit is unplugged. If you care to customize the settings, you'll find a new SpeedStep tab in the existing Power Management applet, which you can access from the Windows Control Panel.

PUT TO THE TEST

Typically, we run benchmark tests on notebook PCs with AC power only, to gauge the maximum level of performance. Since this is our first look at SpeedStep, however, we decided to also run all of our benchmark tests—with the obvious exception of ZD BatteryMark 3.0, which measures battery life—on battery power as well.

On AC power, our seven 650-MHz systems delivered new levels of portable performance. The average ZD Business Winstone 99 score was 25.9, or 9 percent better than the average 500-MHz Pentium III notebook (First Looks, December 1, 1999). On ZD Content Creation Winstone 2000, the 650-MHz systems really shined, yielding an average score that was about 25 percent higher than that of the PIII/500 notebooks.

When we switched to battery power, our 650-MHz systems consistently behaved just like 500-MHz Pentium III notebooks—they were very close to the average PIII/500 scores from our previous roundup. Based on our tests, when running typical business and content-creation applications, you give up about 12 percent performance when

running in battery-optimized mode (based on our Winstone test scores). This sacrifice is well worth the extra battery life. The average ZD BatteryMark 3.0 score was 3 hours 47 minutes, but three of the systems we tested broke the 4-hour barrier.

In short, SpeedStep works as advertised. At the office, you get desktop-level performance. On the road, you get a system that will actually get you from New York to Denver on a single battery, with a little left over. One small SpeedStep PC can bring you one giant leap closer to no-compromise computing.

THIN AND LIGHT

Compaq Prosignia 170

Compaq's latest thin and light portable is the bargain of its class. Priced at \$3,449 (direct), when equipped with 128MB of memory, a 14.1-inch display, and an 12GB hard disk, the system is more than \$200 cheaper than the Dell Latitude CPx and about \$950 less expensive than the IBM ThinkPad 600X 5FU.

Although not as well put together as the ThinkPad—a machine whose physical design is unrivaled—the Compaq Prosignia 170 has several advantages



Compaq packs a lot of features into its new 5.6-pound Prosignia 170—including an integrated modem, Ethernet, and a DVD drive.

Notable features of the Dell Latitude CPx include an optional CD-RW drive and both a trackpoint and a touch pad.

WHAT THE RATINGS MEAN

- ★★★★ - EXCELLENT
- ★★★ - VERY GOOD
- ★★ - AVERAGE
- ★ - FAIR
- - POOR

over its competitors. The unit is the thinnest notebook in this review, and Compaq provides a built-in modem, built-in Ethernet, and a copy of Microsoft Office 2000.

Equipped with a DVD drive, the Prosignia 170 weighs 5.6 pounds (6.5 pounds with AC adapter), which is slightly more than the ThinkPad but a pound less than the Dell and the Hewlett-Packard units. The DVD drive resides in a multipurpose bay, and you can readily replace it with a floppy disk drive or any one of four separately available devices: a CD-ROM, a second battery, a second hard disk, or an LS-120 drive.

The Prosignia 170's performance on our benchmark tests was average. The system scored 25.6 on the ZD Business Winstone 99 tests running on AC power and 59.4 on the ZD CPUmark 99 tests. The unit clocked 3 hours 21 minutes on our ZD BatteryMark 3.0 test—not as good as the Dell or the IBM systems.

You can custom-configure your Prosignia 170, choosing

from multiple screen sizes, processors, and pointing devices. The unit tested at PC Magazine Labs included a pointing stick, but you can also opt for a touch pad. The pointing stick is similar to the one found on the ThinkPad: You can select icons under Microsoft Windows by tapping on the stick, or you can scroll through certain Windows applications using a third mouse button.

Compaq also provides a complete, Windows-based power management (ACPI) interface and access to its Online Services, which are a set of Web applications meant for growing businesses. The keyboard, however, is poorly designed: The keys have little weight to them, and many are undersized. Other than that, the Compaq Prosignia 170 is a promising new entry in the thin and light category.

Compaq Prosignia 170
Direct price: \$3,449. With Pentium III/650, 128MB RAM, 12GB hard disk, 14.1-inch display, DVD drive, floppy disk drive (used externally or in place of a DVD drive). Dell Computer Corp., Houston: 800-345-1518; www.compaq.com. ●●●●



Although it stacks up well in performance and features, the HP OmniBook 4150 is the heaviest (6.8 pounds) of the thin and light systems we tested.

Dell Latitude CPx

Dovetailing well with the rest of the Dell Latitude line, the Dell Latitude CPx (\$3,677 direct) is a two-spindle portable meant for large businesses. The system uses the same removable devices and docking stations as the single-spindle Dell Latitude CS and the Celeron-based Dell Latitude CPT, and like these models, the CPx is compatible with Dell's IT Assistant remote management tool.

Considered as a standalone machine, the CPx isn't as impressive as the ThinkPad—a machine that's lighter, sturdier, and easier to use—but its battery life matches that of the ThinkPad, and its core hardware is formidable. Dell now includes a 14.1-inch display and a CD-RW drive.

At 1.8 inches thick, the CPx includes a multipurpose drive bay that accommodates any one of eight different devices: a CD-ROM, a floppy disk drive, a DVD-ROM drive, an LS-120 drive, a Zip Drive, a second battery, a second hard disk, or a CD-RW drive. The model tested at PC Labs ships with a floppy disk drive (which can also be external) and a CD-RW drive, which is a recent addition to the portable market. With the CD-RW drive installed, the system weighs 6.6 pounds, 7.7 including the AC adapter.

Running on AC power, the unit scored 26.1 on our Business Winstone tests—on a par with the other thin and light systems

reviewed here. The CPx lasted more than 4 hours on our BatteryMark test. Among all SpeedStep systems in this roundup, only the ThinkPad and Dell's desktop replacement unit, the Dell Inspiron 7500, lasted 4 hours or more (the Inspiron 7500 actually lasted 4 hours 59 minutes).

The system's keyboard isn't as comfortable as the ThinkPad's, and the PC Card bay does not have a protective cover, but all other parts are well designed. The CPx includes two pointing devices—a trackpoint and a touch pad. The Dell Latitude CPx is an attractive machine, mostly for corporate users.

Dell Latitude CPx

Direct price: \$3,677. With Pentium III/650, 128MB RAM, 12GB hard disk, 14.1-inch display, CD-RW drive, floppy disk drive (used externally or in place of a CD-RW drive). Dell Computer Corp., Round Rock, TX: 800-388-8542; www.dell.com. ●●●

HP OmniBook 4150

Like the Dell Latitude CPx, the HP OmniBook 4150 is a corporate machine designed for use with other notebooks in the OmniBook line. The system uses the same docking stations and removable devices as the smaller OmniBook 900, and it can use the same software image. The OmniBook is well equipped in its own right, but it is expensive and slightly heavier than the other thin and light machines reviewed here.

The unit is a two-spindle sys-



IBM ThinkPad 600X 5FU, Dell Inspiron 7500

Picking an Editors' Choice is never easy, and this was especially true with these seven SpeedStep-equipped notebook PCs. All of the systems reviewed here deliver consistent, top-notch performance. And each has distinguishing features that will appeal to users' varied preferences. But in the end, we settled on the IBM ThinkPad 600X 5FU and the Dell Inspiron 7500.

A notebook in thin and light class, the IBM ThinkPad 600X 5FU is actually the lightest (5.4 pounds) and one of the thinnest (1.4 inches) SpeedStep systems we tested. Nevertheless, the machine delivered excellent performance, combined with often-overlooked features, such as the best keyboard of any notebook PC we've seen.

At the opposite end is the Dell Inspiron 7500, which weighs more than 10 pounds with its AC adapter, placing it solidly in the desktop replacement category. But in exchange for this, you get an excellent, very flexible three-spindle design and a 15-inch display with a native resolution of 1,400 by 1,050 pixels. An honorable mention goes to the Compaq Presario 1800-XL. Although it has a fixed three-spindle design, the unit still offers solid performance and an remarkable price tag of \$3,200 (street).

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The IBM ThinkPad 600X 5FU carries a high price tag, but it delivers top-notch performance in a compact, well-designed package.

The Compaq Presario 1800-XL has an LCD panel; buttons let you operate the DVD drive even when the unit is turned off.



tem that includes a 18GB hard disk. When the unit is further equipped with a 14.1-inch display, 128MB of memory, and a 650-MHz SpeedStep processor, it sells for \$4,200 (street).

The OmniBook is 1.4 inches thick and with a DVD drive installed weighs 6.8 pounds, which is the heaviest among the thin and light units here. You can easily remove the DVD drive from the chassis and replace it with any of five other devices. The system reviewed here ships with a floppy disk drive that can also be used externally; a CD-ROM, an LS-120 drive, a second battery, and a second hard disk are sold separately.

The system's performance on our benchmark tests was similar to that of the Dell Latitude CPx. Running on AC power, the OmniBook scored 26.3 on our Winstone tests and 59.3 on the CPUmark tests. The system could not match the 4-hour bat-

tery lives of the CPx and the ThinkPad, lasting 3 hours 38 minutes on the BatteryMark test.

Like the Dell Latitude CPx, the OmniBook also includes two pointing devices. You can select icons under Windows simply by tapping on the pointing stick or the touch pad, and you can readily scroll through certain windows using the touch pad. The unit's power management interface is split between Windows and BIOS setup. Its keyboard is mediocre at best, but you can readily manage the system from a remote console using HP's TopTools software.

These features make the HP OmniBook 4150 an appealing option for corporations, but on its own it can't match other thin and light SpeedStep systems reviewed here.

HP OmniBook 4150

Street price: \$4,200. With Pentium III/650, 128MB RAM, 18GB hard disk, 14.1-inch display, DVD drive, floppy

disk drive (used externally or in place of a DVD drive). Hewlett-Packard Co., Palo Alto, CA; 800-322-4772; www.hp.com/omnibook. ●●●

IBM ThinkPad 600X 5FU



Priced at \$4,408 (direct), the IBM ThinkPad 600X 5FU is a two-spindle machine with a 13.3-inch display. Few high-end machines are so thin and light (5.4 pounds, 1.4 inches thick), and none are so cleverly designed.

The ThinkPad's keyboard is comparable with—if not superior to—common desktop keyboards. Like the other thin and light machines reviewed here, the ThinkPad includes a multipurpose drive bay, which can accommodate a CD-ROM drive, a DVD-ROM drive, a floppy disk drive, an LS-120 drive, a Zip Drive, a second battery, or a second hard disk, but only the DVD and floppy disk drive ship with the unit we reviewed. The floppy disk drive can also be used externally via a plastic case, a cable, and a dedicated port on the side of the system.

The ThinkPad performed at roughly the same level as the other thin and light machines here. The notebook produced our roundup's highest Winstone score and excelled on 2-D graphics (Graphics WinMark) tests. But its 4MB NeoMagic MagicMedia 256ZX is not as adept at 3-D graphics as the 8MB ATI Rage Mobility found in other systems reviewed here. Com-

pared with the other thin and light machines, its ZD WinBench Disk WinMark 99 score of 2.345 was well below the average. The unit surpassed the 4 hour mark on our BatteryMark test, however.

Many of the system's primary strengths can't be measured with the benchmark tests. You can tap its pointing stick to select icons under Windows, and a third mouse button lets you scroll through certain Windows applications. And, as mentioned earlier, we were most impressed with the ThinkPad's keyboard.

The IBM ThinkPad 600X 5FU is higher priced than most thin and light systems, but you really get what you pay for.

IBM ThinkPad 600X 5FU

Direct price: \$4,408. With Pentium III/650, 128MB RAM, 12GB hard disk, 13.3-inch display, DVD drive, floppy disk drive (used externally or in place of DVD), built-in modem. IBM Corp., Armonk, NY; 800-425-7255; www.ibm.com/pc/us/thinkpad. ●●●

DESKTOP REPLACEMENT

Compaq Presario 1800-XL

The Compaq Presario line is a top-seller, and looking at the Compaq Presario 1800-XL (\$3,200 street), you can see why. If you need an easy-to-use, Internet-focused desktop-replacement notebook—and you don't care whether you can swap additional drives in and out of it—check out this Compaq unit.

The Presario 1800-XL is a fixed three-spindle notebook, so



Weighing in at more than 10 pounds with its AC adapter, the Dell Inspiron 7500 takes the term desktop replacement literally, but it offers great performance and a long list of features.

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TOSHIBA

its floppy disk drive, 6X DVD-ROM drive, and 12.1GB hard disk are not removable or upgradable. At 7.5 pounds (8.3 with AC adapter) and just 1.8 inches thick, the Presario 1800-XL wins the prize for svelte in our desktop replacement group.

This is one of a few systems in this roundup with a built-in Ethernet adapter and an integrated 56K modem. So whether you connect via cable modem or by traditional means, the Presario 1800-XL is ready right out of the box. The notebook also has a

slew of quick-launch buttons (called the Internet Zone) to take you online, check e-mail, get help, search, or shop.

Another unique feature is Display2, a combination of a backlight LCD display on the front of the notebook, with disk control buttons for play, stop, forward, reverse, and volume control. In other words, this notebook works just like a portable CD player and works even when the notebook is turned off.

On our benchmark tests, the Presario 1800-XL was a competi-

itive performer across the board. Though its BatteryMark score of 3 hours 23 minutes was not a standout, it was still acceptable.

The Compaq Presario 1800-XL's one-year warranty is comparatively short. But if you're looking for a SpeedStep bargain, look no further than this unit.

Compaq Presario 1800-XL

Street price: \$3,200. With Pentium III/650, 128MB RAM, 12.1GB hard disk, 15-inch monitor, floppy disk drive, DVD drive, Compaq Computer Corp., Houston; 800-345-1518; www.compaq.com. ●●●

Dell Inspiron 7500



At the other end of the spectrum from the Presario 1800-XL is the Dell Inspiron 7500 (\$4,606 direct), the biggest system in our desktop replacement category at 9.4 pounds (10.4 with AC adapter), and with a big price tag to match. But in this case, you're getting what you pay for—the biggest hard disk, the best screen, and the most expandability of the machines in this roundup.

BENCHMARK TESTS



Since this is our first story on SpeedStep, which automatically lowers the processor's clock speed and voltage to conserve power when running on batteries, we ran our full series of benchmark tests on battery power as well as on AC power.

The units were separated into two categories: *thin and light* and *desktop replacement*. Each unit was equipped with a 650-MHz Pentium III processor that clocked down to 500 MHz when unplugged. In addition, all systems had 128MB of RAM and Microsoft Windows 98. We ran the tests at a resolution of 1,024-by-768 with 16-bit color, with the exception of the Dell Inspiron 7500 and the Gateway Solo 9300XL, which use higher native resolutions.

In general, all seven systems yielded consistently high levels of performance on our benchmark tests, particularly with AC power. The average ZD Business Winstone 99 score, a measure of performance on everyday business applications, was 9 percent higher than that of 500-MHz Pentium III notebooks (First Looks, December 1). The IBM ThinkPad 600X 5FU edged out the competition on Business Winstone and posted an untouchable score on ZD Business Graphics WinMark 99, which measures 2-D graphics capabilities. The ThinkPad was the only tested system equipped with a NeoMagic MagicMedia 256ZX graphics chip with 4MB; all others had ATI Rage Mobility chips with 8MB. The Dell Inspiron 7500 had the top scores on disk- and processor-intensive tests, while its corporate cousin, the Dell Latitude CPX, notched the leading score on ZD Content Creation Winstone 2000.

To see how well SpeedStep works, it is also useful to compare the results on AC power versus battery power (in battery-optimized mode). On Business Winstone, the SpeedStep systems scored about 12 percent lower when operating on battery power (in other words, at 500 MHz instead of 650 MHz). Hence, if you use battery-optimized mode, you'll be giving up that much performance for better battery life. Similarly, scores decreased by 11 percent when we ran our Content Creation Winstone tests under battery power (using such applications as Adobe Photoshop and Macromedia's Dreamweaver).

Given that SpeedStep actually clocks down the CPU, it was not surprising that the biggest performance differences were in ZD CPUmark 99, which measures integer performance of the processor, and FPU WinMark, which measures floating-point performance. On the average, the CPUmark scores were 20 percent lower when we tested under battery power, and the FPU scores were 23 percent lower.

Perhaps the best news was battery life. When running in SpeedStep's battery-optimized mode, three of the systems delivered more than 4 hours of battery life. The Dell Inspiron 7500 achieved a remarkable 4 hours 59 minutes on ZD BatteryMark 3.0. The amount of battery life gained by using SpeedStep—as opposed to running in maximum-performance mode when unplugged (not charted below)—ranged from 18 minutes (for the Compaq Prosignia 170) to more than 1 hour (for the IBM ThinkPad 600X 5FU).—Analysis written by Laura Cox

RED denotes Editors' Choice.

▲ High scores are best. ▲ Lower scores are best. ▲ Light gray denotes first place.	Resolution	ZD Business Winstone 99		ZD Business Graphics WinMark 99		ZD CPUmark 99		ZD FPU WinMark		ZD Business Disk WinMark 99 (seconds of bytes/sec)		ZD Content Creation Winstone 2000		ZD iBench: Load Complex Pages*		ZD Battery Mark 3.0	
		AC BATTERY		AC BATTERY		AC BATTERY		AC BATTERY		AC BATTERY		AC BATTERY		AC BATTERY		AC BATTERY	
		AC	BATTERY	AC	BATTERY	AC	BATTERY	AC	BATTERY	AC	BATTERY	AC	BATTERY	AC	BATTERY	AC	BATTERY
THIN AND LIGHT																	
Compaq Prosignia 170	1,024 x 768	25.6	22.9	177	153	59.4	47.2	3,470	2,670	2,465	2,420	22.9	20.1	22.0		3:21	
Dell Latitude CPx	1,024 x 768	26.1	22.5	187	161	58.9	47.0	3,470	2,665	2,450	2,305	23.4	20.6	25.3		4:05	
HP Omnibook 4150	1,024 x 768	26.2	23.0	181	156	59.3	47.0	3,470	2,665	2,650	2,540	23.1	20.7	21.8		3:38	
IBM ThinkPad 600X 5FU	1,024 x 768	26.4	23.0	208	181	58.7	46.7	3,470	2,670	2,345	2,295	22.8	20.4	28.4		4:02	
DESKTOP REPLACEMENT																	
Compaq Presario 1800-XL	1,024 x 768	25.9	22.7	181	156	58.7	46.8	3,465	2,665	2,335	2,265	22.3	19.5	20.7		3:23	
Dell Inspiron 7500	1,400 x 1,050	25.5	23.0	185	158	59.7	47.5	3,490	2,680	3,020	2,935	22.9	20.6	21.6		4:59	
Gateway Solo 9300XL	1,280 x 1,024	25.6	22.5	192	164	58.5	46.8	3,470	2,660	2,450	2,315	22.0	19.6	27.5		3:00	
AVERAGE		25.9	22.8	187	161	59.0	47.0	3,472	2,668	2,532	2,439	22.8	20.2	23.9		3:47	
AVERAGE PIII/500**		23.7	N/A	161	N/A	N/A	N/A	N/A	N/A	2,697	N/A	18.3	N/A	N/A	N/A		3:43

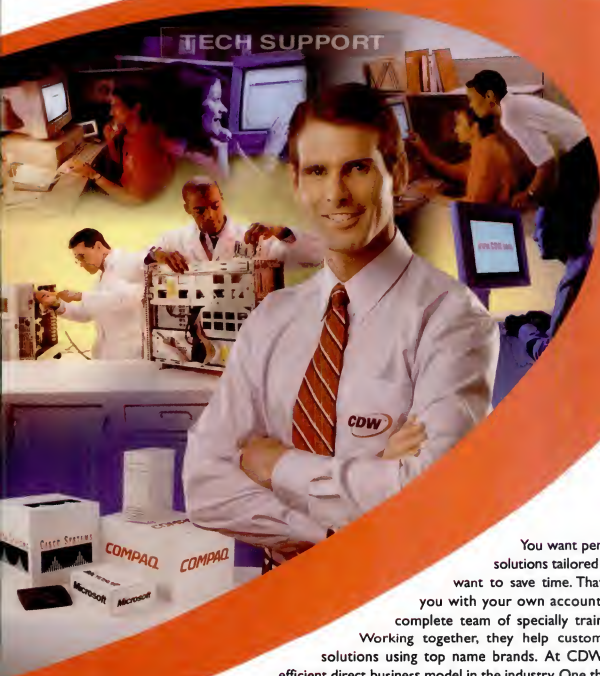
* With a 100MB Ethernet connection.

** First Looks, 12/1/99; reported for comparison.

N/A—Not applicable: We did not run this test.

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The Inspiron 7500, like many other notebooks, touts a 15-inch display. But with a high native resolution of 1,400 by 1,050 pixels, this one is unique. So though its physical size is smaller than the big 15.7-inch screen found on the Gateway Solo 9300XL, the Inspiron 7500 actually displays more data. And with its huge 25GB hard disk, you'll have plenty of space to store that data.

This notebook is also as flexible as it is large. Up front are two bays that can accommodate many devices. In our test machine, the Combo Media Bay had a 6X DVD/floppy disk drive module installed; and the Mega-Bay had a big, 79-watt-hour battery. For the above price, you also get a modular Zip Drive. Either bay will also take an additional hard disk, so when you're on AC power, you can get up to 75GB of storage.

The Inspiron 7500's big battery certainly paid off on our BatteryMark measure, lasting nearly 5 hours and outrunning its closest competitor by almost an hour. It also garnered top scores on our CPUmark, FPU-WinMark, and Business Disk WinMark tests.

You'll also find some extra perks included, such as a 3Com Fast Ethernet PC Card adapter

and a copy of Microsoft Office 2000 Small Business Edition.

The Dell Inspiron 7500 is a big notebook—with features and performance to match.

Dell Inspiron 7500

Direct price: \$4,606. With Pentium III/650, 128MB RAM, 25GB hard disk, 15-inch display, combo DVD/floppy drive, Zip Drive. Dell Computer Corp., Austin, TX; 800-388-8542; www.dell.com. ●●●●●

Gateway Solo 9300XL

If you crave the bragging rights associated with carrying the notebook with the biggest display, look no further than the Gateway Solo 9300XL (\$4,274 direct). The Solo's 15.7-inch 1,280-by-1,024 display may not be the highest-resolution panel you can buy, but it certainly is the largest.

To get that entire panel into a portable package (which does fit in a standard briefcase, by the way), Gateway added an extension to the wrist rest area that's nearly 2 inches deep. The display housing also hangs over both sides of the base of the notebook by about 1/8 inch. But even so, the system is still only 1.8 inches thick and weighs 9.5 pounds with an AC adapter—that's half an inch thinner and a pound lighter than the Dell Inspiron 7500.



The Gateway Solo 9300XL's trump card is its massive 15.7-inch LCD, but it has a lower native resolution than the Dell Inspiron 7500.

The Solo 9300XL is a three-spindle notebook. Our test machine included a 4X DVD-ROM drive and a LS-120 drive. Options for other devices run the standard gamut from a CD-ROM drive to a floppy disk drive to a second hard disk, but you can also get a CD-RW drive (a \$350 option).

Like the Presario 1800-XL, the Solo 9300XL has buttons for one-touch access to the Internet, e-mail, and help. The unit has as programmable keys to launch your favorite applications as well as CD/DVD control buttons. But this unit is also uniquely equipped for a variety of high-end tasks, with its integrated FireWire, S/PDIF connectors,

and composite video in and out.

On our tests, the Gateway Solo 9300XL performed at the lower end of the spectrum on our Winstone Content Creation Winstone tests. The system did perform near the top on the ZD Business Graphics WinMark 99 test, however.

It's tough to top a 15.7-inch screen for watching DVDs. But for other tasks, the other systems reviewed here offer better all-around performance.

Gateway Solo 9300XL

Direct price: \$4,274. With Pentium III/650, 128MB RAM, 12GB hard disk, 15.7-inch display, DVD-ROM drive, 120MB SuperDisk Drive. Gateway Inc., Sioux City, SD; www.gateway.com. ●●●●●

SUMMARY OF FEATURES

650-MHz Pentium III Notebooks

THIN AND LIGHT

	Compaq Prosignia 170	Dell Latitude CP2s	HP OmniBook 4150	IBM ThinkPad 600X 5FU	Compaq Presario 1800-XL	Dell Inspiron 7500	Gateway Solo 9300XL
Price (with 128MB RAM)	\$3,449 direct	\$3,677 direct	\$4,200 street	\$4,466 direct	\$3,200 street	\$4,606 direct	\$4,274 direct
System weight/Travel weight* (pounds)	5.6 / 6.5	6.6 / 7.7	6.8 / 7.6	5.4 / 6.2	7.5 / 8.3	9.4 / 10.4	8.6 / 9.5
Dimensions (HWD, in inches)	1.1 x 12.4 x 9.8	1.8 x 12.6 x 9.9	1.4 x 12.1 x 10.0	1.4 x 11.8 x 9.4	1.8 x 13.0 x 11.0	2.3 x 13.0 x 10.5	1.8 x 13.1 x 11.2
Maximum installable RAM	512MB	512MB	512MB	576MB	320MB	512MB	288MB
LCD-panel size (inches)	14.1	14.1	14.1	13.3	15.0	15.0	15.7
Native screen resolution	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,400 x 1,050	1,280 x 1,024
Graphics chip set	ATI Rage Mobility-P	ATI Rage Mobility M1	ATI Rage Mobility M1	NeoMagic MagicMedia 256Zx	ATI Rage Mobility M1	ATI Rage Mobility-P	ATI Rage Mobility-P
Graphics memory	8MB	8MB	8MB	4MB	8MB	8MB	8MB
Hard disk capacity	12GB	12GB	18GB	12GB	12.1GB	25GB	12GB
DVD drive	Swappable 4X	None	Swappable 6X	Swappable 6X	Fixed 6X / 24X	Swappable 6X / 24X	Swappable 4X / 24X
Additional drives included in price	Swappable floppy disk drive	Swappable CD-RW, swappable floppy disk drives	Swappable floppy disk drive	Swappable floppy disk drive	Fixed floppy disk drive	Swappable floppy disk drive**	120MB SuperDisk drive
Standard warranty on parts/labor	3 years/1 year	3 years/3 years	3 years/3 years	3 years/3 years	1 year/1 year	3 years/3 years	3 years/3 years
Service and Reliability grade†	B	B	C	A	B	B	B

RED denotes Editors' Choice.

* Travel weight adds the AC adapter.

** Part of the DVD combination module.

† PC Magazine, July 1999.



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Norton Moves to the Net

BY LARRY SELTZER

In light of the fact that the Internet has many more threats other than viruses, responsible companies protect their networks with firewall software. Symantec Corp. has released **Norton Internet Security (NIS) 2000** (\$53.95 downloadable), a "personal firewall" product that mixes these functions with parental monitoring and Web ad blocking. The product usually works well but, at times, it blocks information that you might want to see.

Although NIS looks like a new product, it is based on AtGuard, a personal firewall product that Symantec licensed from WRQ. NIS retains the advanced configuration feature as an option but has simplified the main interface, letting users choose low, medium, or high levels of protection.

The firewall lets you block ActiveX controls and Java applets, as well as more primitive TCP/IP attacks, and has special built-in rules designed to block hack attacks from notorious programs such as BackOrifice. The list of safeguards is adequate, but NIS could better describe what happens when it blocks something—the user gets are numbers summarizing how many blocks have occurred.

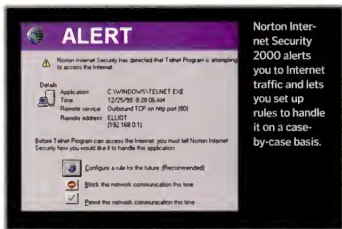
The ad blocker monitors Web page loading, determines which graphics are advertisements, and stops them from downloading. But we found some Web pages in our own ZDNet Community for which the feature blocked nonadvertising graphics, rendering the pages unviewable. We were able to adjust the ad blocker's advanced properties to correct the problem, but this was a complicated process.

The Parental Control feature has bigger holes, although it will certainly block access to most objectionable content. A database of such sites, categorized with such terms as Crime and Drugs/Advocacy, lets the system

administrator select which categories to block. Another option is to block all sites by default and then create an exception list of acceptable sites. This scheme doesn't block objectionable content that arrives via e-mail.

The Norton LiveUpdate feature updates the Parental Control database as well as the software itself. A copy of NIS includes a one-year subscription to updates, with renewals costing \$19.95 a year.

As expected in Version 1.0, NIS has some minor bugs. But in general Symantec Corp. has done a fine job of taking the ad-



vanced technology in AtGuard and giving it a friendlier face.

Norton Internet Security 2000
Direct price: Downloadable version,

\$53.95; CD version, \$59.95. Requires: 24MB RAM (32MB recommended), 60MB disk space, Microsoft Windows 95 or 98. Symantec Corp., Cupertino, CA; 408-253-9600; www.symantecstore.com. ●●●

Out-of-Site Editor

BY EDWARD MENDELSON

Already one of the top tools for designing professional-looking Web pages with little or no knowledge of HTML, NetObjects Fusion is now a premiere program for building entire sites. Improvements such as the ability to view and edit code, better support for Cascading Style Sheets (CSS), and advice on everything from planning to promoting your site make **NetObjects Fusion 5.0** (\$300 street) the Web site editor of choice for home and small-business users.

Unlike Microsoft FrontPage 2000, Fusion unfortunately still cannot open more than one site

at the same time, and the program still makes you jump around its various views—from site structure, page editor, style-sheet selector, file listings, and publish settings. But Fusion 5.0 surpasses FrontPage 2000 by offering customizable navigation bars. Fusion 5.0 also provides the same precise control over layout found in desktop publishing programs.

This new version retains the basic interface of earlier versions. The site management view lets you copy and paste pages to another region of the site, simplifying layout reproduction. Microsoft Word documents can be imported directly into a site and

then reformatted to match the site style. The page-editing view includes two new tabs—one that displays the complete HTML code for the current page and a second that previews the page in Microsoft Internet Explorer. The HTML tab lets expert users insert custom code between tags generated by Fusion.

Fusion's style management page—from which you select graphics and text styles that apply to part or all of a site—now supports Cascading Style Sheets (CSS). The publishing page now supports background uploading, so you can edit pages while transferring files and optionally delete remote pages before uploading new ones. The new Online page includes advice on creating and promoting Web sites, with links to third-party add-ins and other enhancements to Fusion itself.

For text-heavy sites with little page design, FrontPage is still better than Fusion. But for effortless and visually spectacular Web sites, NetObjects Fusion 5.0 will get the job done.

NetObjects Fusion 5.0

Street price: \$300; upgrade, \$100. Requires: 32MB RAM, 50MB hard disk space, Microsoft Windows 95 or NT 4.0 or later. NetObjects Inc., Redwood City, CA; 888-892-0702; www.netobjects.com. ●●●



Fusion 5.0's new online view provides advice and links for building Web sites but doesn't directly alter the site you're editing.

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A Cool 1,000 MHz

BY CADE METZ

The i-gigahertz processor is here. The chip is actually an AMD Athlon/750 cooled to subzero temperatures using technology developed by KryoTech and then clocked up an additional 250 MHz. The **SYS Cold-Fusion 1000** (\$4,444 direct), from SYS Technology, one of the first systems to use this configuration, scores unusually well on our processor-specific benchmark tests. But because it is constrained by a slow secondary cache and an IDE hard disk subsystem, it performs no better than fast Pentium III or AMD Athlon-based systems on everyday business applications.

The Cold-Fusion is essentially a PC that sits on top of a small refrigerator. Via an insulated tube that runs up through the base of the system's chassis, the refrigerator keeps an over-clocked CPU cooled to roughly minus 40 degrees Celsius. At such a temperature, the chip can operate at 1-GHz clock speeds without risk of overheating or premature failure and may, according to KryoTech, perform more efficiently than at room temperature. KryoTech supplies the chassis, the cooling unit, and the motherboard, then SYS Technology installs its own peripherals—including dual 7,200-

rpm hard disks, 128MB of memory, and a graphics card based on nVidia's GeForce 256 chip set.

The Cold-Fusion connects to a 19-inch monitor, a five-piece speaker system, a common keyboard, and an optical mouse conducive to game playing. SYS

the CPU. Once the CPU reaches minus 40 degrees (after a delay of roughly 60 to 90 seconds) the system boots to Microsoft Windows.

On our ZD CPUmark 99 test, which measures raw processor speed, the Cold-Fusion performed roughly 13 percent better than a comparably equipped Pentium III/800 unit, the Dell

24 percent higher than the Athlon unit.

Running Winstone, however, which reflects a system's ability to handle common business applications, the Cold-Fusion scored slightly lower than both the Athlon and the Pentium III units. This is likely the result of a couple of bottlenecks. Whereas a standard Athlon machine has an L2 cache that runs at half the processor's clock speed, the Cold-Fusion's L2 cache can synchronize with its 1-GHz processor only by running at one-third the speed. The Dell unit has a 400-MHz secondary cache, and the Cold-Fusion has a 333-MHz cache. Furthermore, though the system uses dual 7,200-rpm hard disks run by an IDE RAID controller, its hard disk performance can't scale up with the speed of the processor.

All system parts provided by KryoTech—the motherboard, (including the CPU) and the chassis (including cooling unit and power supply)—are covered by a one-year parts-and-labor warranty. All other parts are covered by SYS Technology's standard warranty, which provides free parts for three years and free labor for five years.

SYS Cold-Fusion 1000

Direct price: \$4,444. With AMD Athlon/750, 128MB RAM, 18.2GB hard disk, 19-inch monitor, SYS Technology Inc., Cypress, CA; 800-613-9963; www.sys.com ●●●



With a refrigeration unit in its base, the SYS Cold-Fusion 1000 is nearly 26 inches tall and a foot wide. An insulated cooling tube (right) runs from the cooling unit to the processor, keeping the over-clocked CPU at a wintry minus 40 degrees Celsius or cooler (see insert).

Technology intends the system to be used for gaming as well as digital content creation, graphic design, CAD/CAM, desktop publishing, and financial analysis.

When you press the system's power button, the cooling unit turns on and begins to cool

Dimension XPS B800r, and a similar Athlon/800 system, the Falcon Northwest Mach V. The Cold-Fusion also scored over 28 percent higher than the Pentium III unit under FPU WinMark 99, which measures the speed of floating-point calculations, and

BENCHMARK TESTS



To find out just how good performance can be on a system running at a whopping 1 GHz, we compared it with the fastest conventional (that is, not over-clocked) PCs that we could get our hands on—in this case a Dell Dimension XPS B800r with an 800-MHz Pentium III processor and a Falcon Northwest Mach V with an 800-MHz AMD Athlon chip.

All three systems came with 128MB of RAM. The SYS Cold-Fusion 1000 excelled on processor-intensive tests (ZD 3D Win-

Mark 2000, ZD Business Graphics WinMark 99, ZD CPUmark 99, and ZD FPU WinMark 99), which reflect the high-end tasks such a system would be called on to perform. But on everyday business applications, the system offers little or no performance gain versus 800-MHz systems, most likely because other system components such as the hard disk simply cannot keep up with the processor. For more information on the 800-MHz systems, see our head-to-head review online at www.zdnet.com/pcmag/filters/pclabs/pcs.

High scores are best. Small system denotes first place.	Processor	Clock Speed (MHz)	ZD Business Winstone 99	ZD Content Creation Winstone 2000	ZD 3D WinMark 2000	ZD Business Graphics WinMark 99	ZD CPUmark 99	ZD FPU WinMark 99	ZD Business Disk WorkMark 99 (performance ratio per record)
SYS Cold-Fusion 1000	Athlon/750	1,000	30.1	32.3	65.3	379.0	86.0	5,400	5,695
Dell Dimension XPS B800r*	Pentium III/800	800	32.0	31.3	52.3	327.5	70.6	4,210	5,710
Falcon Northwest Mach V*	Athlon/800	800	30.8	30.3	N/A	354.5	70.2	4,345	5,400

We ran all tests at 1,024-by-768 resolution with true color.

* Reported for comparison. See our story online at www.zdnet.com/pcmag/filters/pclabs/pcs.

N/A—Not applicable. The product could not complete this test.

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Put a Scanner in Your Pocket

BY BRUCE AND MARGE BROWN

Think portable scanners are too bulky for your mobile computing arsenal? Look again. The Siemens Pocket Reader (\$100 street) and the WizCom QuickLink Pen Personal Scanner (\$150 street) are designed for low-volume text scanning. They function like digital highlighters to capture lines in articles, notes, business cards, memos, and books at 400-dpi resolution.

Each device weighs roughly 3.7 pounds, runs on two triple-A batteries, and connects to a PC via a serial cable (the QuickLink Pen connects also by infrared). With practice, you can expect good accuracy from the QuickLink Pen; the Pocket Reader is more hit-or-miss.

The **Siemens Pocket Reader** reads 8- to 16-point text in common fonts. A row of five control buttons and a 24-character single-line display are on the side of the Pocket Reader. The device can store about 40,000 characters in its 556K of memory.

To scan, hold the Pocket Reader at a right angle to the paper, press the scanning head on the tip of the device against the paper, and roll it over a line of text. When you connect the Pocket Reader to a PC, the uploaded scanned text is displayed in the program's window for editing and transferring to other applications such as Microsoft Windows or Excel.

We had difficulty holding the

Pocket Reader in the correct position; not one line scanned perfectly in our testing. Although easy to configure and operate,

the Pocket Reader is too sensitive to positioning and speed.

Siemens Pocket Reader

Street price: \$100. Requires: 2.5MB RAM; 5MB hard disk space; Microsoft Windows 95, 98, 2000, or NT 4.0 or higher. Siemens AG Austria, Norwalk, CT; 800-665-8445; www.pocketreader.com. ●●●

Using the **WizCom QuickLink Pen Personal Scanner** either as a portable text scanner or as a desktop peripheral to scan text directly into Windows applications, you can scan text in 6- to 22-point text, in either a left-to-right or right-to-left direction. The QuickLink Pen boasts 2MB of flash memory for text storage and an upgradable 2MB of ROM

for applications.

Seven controls are easy to access and operate by thumb; the 3-line, 25-character-per-line display is viewable while you scan.

To capture text, hold the QuickLink Pen at a 75- to 90-degree angle from the paper and gently guide it across a line. In testing, after a few minutes of practice, we captured most text lines accurately on the first try.

WizCom QuickLink Pen Personal Scanner

Street price: \$150. Requires: 16MB RAM; 8MB hard disk space; Microsoft Windows 95, 98, or NT 4.0 or later. WizCom Technologies Inc.; Acton, MA; 888-777-0552; www.wizcomtech.com. ●●●●

An LCD With TV

BY ALFRED POOR

If you're looking for one more reason to switch to an LCD monitor for your desktop, you've got one with the **Samsung SyncMaster 150MP** (\$1,500 street). In addition to an active-matrix, XGA, 15-inch LCD monitor, you also get a unit capable of displaying video and broadcast television at the same time. These extra features, however, come at a steep price.

You get an excellent display for the money you spend. The monitor's XGA images are sharp

and stable, and the automatic image-adjustment feature effectively manages image position and signal synchronization. We found only a tiny hint of pixel jitter in some images on our tests. Color reproduction was accurate, with excellent color tracking across all shades of gray.

The monitor comes with a convenient on-screen display (OSD) for the configuration controls. The icons are more detailed than the average OSD, and the menus are easy to use, with the soft-touch buttons on the control panel. The infrared remote control also makes adjusting the panel's settings easy. The monitor also comes with a color-calibration utility.

The 150MP has a standard RGB signal input, two video inputs (composite and S-video), and an input for broadcast television (cable or antenna). You can display any of these sources as full-screen images, or you can choose any one of the video sources to display as a picture-in-picture (PIP) on top of the computer data display. You can watch these other sources even when the computer is turned off, which is one advantage over using a TV tuner card in your computer.

The monitor does have a few shortcomings. The cable connections are bit cramped and difficult to reach, and the 150MP has only a single volume control, so you may have to adjust the volume as you switch between image sources.

Without a doubt, the Samsung SyncMaster 150MP delivers good image quality, but for the same \$1,500, you could purchase three 19-inch CRT monitors and still have enough money left to buy a TV tuner card for your PC. The 150MP looks great, but you pay a high premium for adding television to an LCD monitor.

Samsung SyncMaster 150MP

Street price: \$1,500. Samsung Electronics America Inc., San Jose, CA; 800-726-7864; www.samsungmonitor.com. ●●●●



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Double Your Graphics Pleasure

BY LOYD CASE

The fastest graphics chip can be crippled if it can't move the data from video memory to the graphics chip and back. One solution is to have multiple rendering engines, each with its own dedicated pool of memory. A more elegant solution is simply to use faster memory.

The current candidate for fast video memory is known as **DDR SDRAM**. DDR (double data rate) is a fine solution because it doesn't involve running the memory clock faster. Instead, two chunks of data are moved with each memory clock cycle. This technology essentially doubles the memory bandwidth of a graphics card.

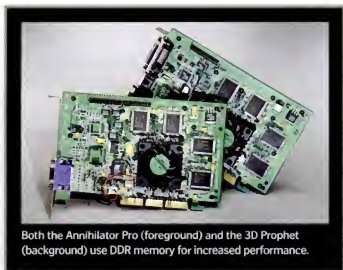
We took a look at a pair of graphics cards that are among the first to use DDR memory: the **Creative Labs 3D Blaster Annihilator Pro** (\$300 street) and the **Hercules 3D Prophet DDR-DVI** (\$300 street). Using the new **nVidia GeForce 256** graphics accelerator chips, both cards proved to be among the fastest consumer-level 3-D graphics cards available today.

What card you buy depends heavily on how you value the trade-off between software and hardware features. On the one hand, business users will like the DVI output on the Prophet, but the Annihilator Pro's E-Color tools are also useful for heavy graphics users.

The **Creative Labs 3D Blaster Annihilator Pro** offers fewer hardware features than the Prophet but more software amenities. Like the Prophet, it ships with 32MB

version of Need for Speed: High Stakes and a limited version of Evolve, an action game.

Of more interest to graphics and business users are the Col-



Both the Annihilator Pro (foreground) and the 3D Prophet (background) use DDR memory for increased performance.

of 6-ns (183-MHz) DDR SDRAM.

The Annihilator Pro has only a single VGA output connector, although it does have an internal connector for a DVI daughter-card (currently not available). The Annihilator Pro offers essentially identical performance to the Prophet; the key difference was in the Expendable test scores, which may be attributable simply to the difference in driver revisions. The card's 2-D performance was also neck and neck with that of the Prophet.

What's compelling about the Creative Labs card is the bundled software. On the gaming side, the card ships with the full

orific and 3Deep color-balancing and color-matching tools from E-Color. There's also WinDVD, a capable if limited software DVD player. The overall DVD image quality is comparable to that of the Prophet: quite good, but with minor flaws during fast camera movement.

Creative Labs 3D Blaster Annihilator Pro

Street price: \$300. Creative Labs Inc., Milpitas, CA; 800-998-5277; www.creative.com.

The Hercules 3D Prophet DDR-DVI (now owned by Guillemot International) ships with 32MB of 6-ns DDR SDRAM. The card also has a DVI interface for use with

the new generation of flat-panel displays and digital monitors. Rounding out the output options is an S-Video TV output and a VGA connector.

The DVI output works well with the ViewSonic VP-18i digital flat-panel display. TV output is more limited, forcing the computer display to run at the same resolution and refresh rate as a TV monitor (800-by-600 maximum resolution at 60 Hz). The control panel allows extensive customization of 3-D features and performance but is buried in a somewhat confusing interface.

The 3D Prophet is a nimble performer, coming through with some of the highest scores we've seen on our 3D WinMark 2000. It was no slouch in the 2-D arena either, posting high scores on our ZD Business Winstone 99 and ZD Content Creation Winstone 2000 benchmark tests.

Of course, this card is aimed squarely at the high-end gaming market. It ran the Quake III Time Demo at close to 57 frames per second (at 1,024-by-768, with 32-bit color). Its fps rate while running Expendable at that resolution was also quite good.

The only software bundled with the 3D Prophet consists of game demos and Xing Technology's software DVD playback utility. DVD playback with the 3D Prophet is good, though we saw some blurring in scenes with exaggerated motion.

Hercules 3D Prophet DDR-DVI
Street price: \$300. Hercules, Montreal; 877-484-5536; www.hercules.com.

BENCHMARK TESTS



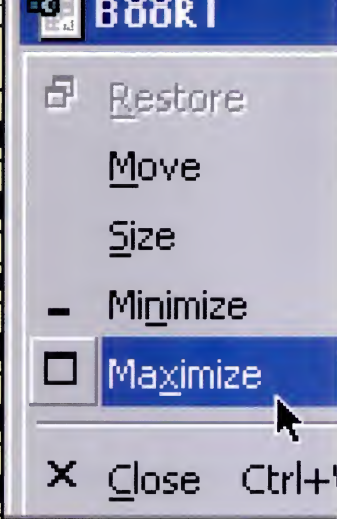
We tested 2-D performance using ZD Business Winstone 99 and ZD Content Creation Winstone 2000. Both are applications-oriented test suites. We collected 3-D performance data using ZD 3D WinMark 2000. Working with *Computer Gaming World* (one of our sister publications) we set up and ran 3D

GameGauge 2.5, which was conducted with Quake III Time Demo (from id Software) and Expendable (from Rage Software). We ran all performance tests on a Dell Dimension XPS T550, with a 550-MHz Pentium III processor, 128MB of SDRAM, an IBM 7,200-rpm IDE hard disk, and a Toshiba 6X DVD-ROM drive.

	3D GameGauge 2.5: Quake III Time Demo (frames per second)	3D GameGauge 2.5: Expendable (frames per second)	ZD Business Winstone 99 (frames per second)	ZD Content Creation Winstone 2000 (frames per second)	ZD 3D WinMark 2000 (frames per second)	ZD Business Graphics WinMark 99 (frames per second)	ZD High-End Graphics WinMark 99 (frames per second)
Creative Labs 3D Annihilator Pro	56.4	21.0	57.0	28.4	23.3	17.8	69.3
Hercules 3D Prophet DDR-DVI	56.5	21.6	49.8	39.9	23.5	17.6	69.3

For 3D GameGauge, we disabled Vsync. For the two Quake III tests, we set the texture slider at 2 (out of 3) and the filtering menu at trilinear. We ran all tests at 32-bit color.

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**OUR SCANNERS CAN HANDLE THE TOUGHEST LOADS
WHILE STILL CARING FOR YOUR DELICATES.**



Get to Know Your Network

BY LES FREED

No matter how complicated your network, **Visio 2000 Enterprise Edition** (\$995 list) takes the grunt work out of documenting it. Like previous versions of Visio, Visio 2000 Enterprise Edition gives virtually anyone the ability to create clear, concise technical drawings with minimal effort. The program includes a library of over 18,000 manufacturer-specific network shapes—everything from the smallest eight-port Ethernet hub to large enterprise-class switches.

But the big news is Visio 2000's AutoDiscovery and Auto-Layout features. These two technologies work hand in hand to help locate, document, and diagram all the equipment connected to your network.

Visio 2000 uses SNMP (Simple Network Management Protocol) to identify common network devices such as routers, switches, and managed hubs,

but we were impressed with its ability to locate and identify non-SNMP devices such as Microsoft Windows PCs, print servers, and non-SNMP routers.

As Visio 2000 locates new devices, it builds a database of network equipment; the program's AutoLayout wizard uses the database to create a detailed, presentation-quality diagram of your network configuration. The resulting diagram is uncannily accurate; each piece of equipment is drawn as a picture that accurately represents the equipment's physical shape, down to the connectors and LEDs.

Web masters will appreciate the Web Layout diagram, which draws a detailed map of any Web site, complete with a list of all files, links, graphics, plug-ins, Java applets, and HTML documents. We were able to create a complete map of the www.pcmag.com server in about an hour.

Visio 2000 can also import directory information from Net-



Visio 2000 takes the hard work out of network diagramming by automatically generating comprehensive, detailed maps.

Ware NDS, Microsoft Active Directory, and LDAP directory servers, so you can easily create a diagram of users, groups, and other directory objects using the data imported from your directory server.

Once you've created your diagram, you can store it, print it, or output it in dozens of formats, including HTML, PowerPoint slide show, or Vector Markup Language (VML). An embedded hyperlink processor lets users link a Visio shape to another Visio document, to a hyperlink on the Web, or to an external Microsoft Office document.

A \$995 add-on package, called

Real-Time Statistics, captures SNMP data in real time and displays the data in graphs and charts. This package effectively turns Visio 2000 into a real-time network analyzer.

The new Visio 2000 Enterprise Edition retains the original product's simple, effective drag-and-drop interface that gives even the most artistically challenged user the ability to create attractive, understandable diagrams and drawings.

Visio 2000 Enterprise Edition
List price: \$995; Real-Time Statistics
add-on, \$995. Visio Corp., Seattle;
800-248-4746; www.visio.com.

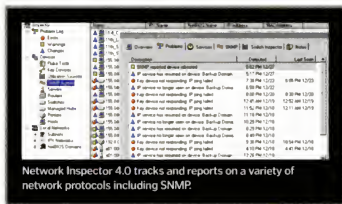
◆◆◆◆◆

Uncover Network Problems

BY FRANK J. DERFLER, JR.

LANs have become more complex to manage and more likely to malfunction. Today, we have more problems with addresses and routing than with cables and hubs. Fluke Corp.'s **Network Inspector 4.0** software (\$995 list), part of a large family of Fluke network testing hardware and software, can uncover those subtle and annoying problems and tell you how to fix them.

Network Inspector discovers all of the devices on the network, not just IP devices, and monitors them for changes or errors. The program can graphically report on and inventory any devices using the IPX, Net-



Network Inspector 4.0 tracks and reports on a variety of network protocols including SNMP.

BIOS, or TCP/IP protocols.

Network Inspector listens to the network using agent programs running on PCs on each segment. Because the program gets behind switches, it can report on the health of and generate detailed reports on each switch. The agent programs report to one or more central console programs—depending on which package you buy.

Network Inspector can launch Visio 2000 Standard, Profession-

al, or Enterprise Editions (see the above review); you can then feed the version you've selected information and use its icons and images of specific equipment to create a detailed network diagram. In about half an hour, we installed the software, monitored a network of several hundred nodes, and produced our first Visio diagram.

On our tests on a real-world network, Network Inspector immediately spotted many net-

worked printers that were using a manufacturer's single, default IP address. Because Network Inspector can determine a device's network name, we were able to print out a detailed list of printers needing attention.

When we reviewed Version 2.1 (First Looks, June 30, 1998), the software missed a few tricks, but we thought it was solid and easy to use. Now, the software doesn't miss anything, and it remains easy to use.

You can buy Network Inspector 4.0 as a direct download from Fluke's Web site. Start with the free 15-day trial package. The basic package (\$995 list) provides one console and the ability to monitor as many as 250 nodes. A five-console, 1,000-node package costs \$4,995 (list), and a ten-console system is \$9,995 (list).

Network Inspector 4.0

List price: Basic package, \$995. Fluke Corp., Everett, WA; 800-443-5853; www.fluke.com. ◆◆◆◆◆

HP LaserJet 3150 Series Now Networkable

BY BRUCE BROWN

Hewlett-Packard's new HP LaserJet 3150 (\$600 street) adds networking capability to an earlier model, the LaserJet 3100, which sold for \$100 more. The LaserJet 3150 combines 600-dpi, 6-ppm printing, copying, and scanning with standalone fax and PC-based fax functions.

The LaserJet 3150 measures 15.3 by 12.0 by 23.5 inches (HWD) with all trays and paper guides extended. The printer input and output trays both hold 100 sheets, and the ADF (automatic document feeder) can hold 30 source-document pages for copying, faxing, and scanning. The HP unit's 2MB of fax memory holds approximately 150 typical fax pages.

Both the printing and fax services can be accessed if the optional HP JetDirect External Print Server (\$300) is installed. The print server, which we did not test, is a 10-Mbps network device.

HP's JetSuite Pro software supports drag and drop, links to major programs such as Microsoft Office applications, and automatically pops up a menu on the computer screen when a source document is placed in the ADF tray.

If you don't need color printing capability, the HP LaserJet 3150, with typical laser-sharp printing and new networking capability, is a reliable, easy-to-use, all-purpose workhorse for small-business and SOHO applications.

HP LaserJet 3150

Street price: \$600. Requires: 16MB RAM for Microsoft Windows 95 or 98, 32MB RAM for Windows NT 4.0, 64MB RAM for Windows 2000; 65MB hard disk space. Hewlett-Packard Co., Palo Alto, CA; 800-752-0900; www.hp.com. ●●●●



The Tektronix Phaser 850DX combines quality color output, speed, and now better network support.

A Smarter Tektronix Printer

BY M. DAVID STONE

Tektronix printers have the reputation for high-quality output at reasonably fast speeds, but their Achilles' heel has always been a lack of network support. The Tektronix Phaser 850DX (\$4,300 street, as tested) is out to change all that. This solid-ink (resin-based) color printer adds network support, which ranges from good (for remote administration) to superb (for installation). And Tektronix throws in IPP (Internet Printing Protocol) for good measure.

To say that we were impressed with the network installation is an understatement. If you're working with Microsoft Win-

dows 9x or NT 4.0, setting up the 850DX on a network consists of little more than putting the CD-ROM in a drive and running the install routine. Install finds the 850DX on your network and checks whether the unit has an IP address assigned. If the system doesn't, the installer finds a free IP address for you.

Quite simply, this is the slickest network printer installation we've seen. And installing the driver on additional systems is just as easy. The process is a bit less automated for Microsoft Windows 2000 but still doesn't require much knowledge of networks. Note, too, that the printer works with the IPP feature in Windows 2000 for printing over

an intranet or the Internet.

Remote management is a little less impressive. Although the printer still lags behind in this feature compared with similar units from industry leaders Hewlett-Packard and Lexmark, the 850DX is now finally in the same league with them.

Output quality varies with resolution, which ranges up to 600 by 1,200 dpi. In general, text delivers well-formed, dark characters; graphics offer brilliant colors with little or no visible dithering at the two highest resolutions; and photos are true photo quality at the highest resolution.

Performance is also impressive, particularly for color output. We timed a 50-page text file at under 7.0 minutes in standard mode, a 12-page PowerPoint presentation at 3.5 minutes in enhanced mode, and a full-page photo at just under 6.0 minutes in highest quality mode.

All these traits make the Tektronix 850DX a highly attractive package for the small office, workgroup, or department.

Tektronix Phaser 850DX

Street price: As tested, with high-capacity paper tray, 128MB RAM, built-in two-sided printing, 6GB hard disk, \$4,300; base model, \$2,500. Tektronix Inc., Wilsonville, OR; 800-835-6100; www.tek.com/color_printers. ●●●●

Whole Web Browsing for Wireless PDAs and Phones

BY BRUCE BROWN

If you're already using a 3Com Palm device or an Internet-enabled phone and aren't satisfied with the limited Web access from the Palm unit's Web clipping or from wireless Web services, Digital Paths may have what you need. Its DPWeb application (free download) lets you surf the Internet freely; the only limitations are those imposed by the Palm device.

If you want to use a PCS Sprint digital phone with Wireless Web service and Phone.com's

UP.Browser microbrowser, you can point to www.digitalpaths.net and from there get full text and link access to all Web sites. You never pay for anything beyond your normal data transfer or time charges.


We tested DPWeb with a Palm VII and a Qualcomm 1960 PCS Sprint phone with Wireless Web, and in both cases the device and the service behaved as expected. Entering URLs with a telephone keypad is not a lot of fun, although we got quicker with practice.

Web surfing on a Palm VII or Wireless Web-enabled telephone isn't the same as on a desktop: There's no color and no (or only limited) graphics. Neither device supports Java or JavaScript, nor does the technology support cookies or Secure Socket Layer, and frames can be problematic.

Though DPWeb may not bring you the Web in its entire multimedia splendor, this important new service does give wireless information seekers a new way to access information.

DPWeb

Price: Free. Works with any wireless device equipped with Phone.com's UP.Browser microbrowser. Digital Paths LLC, Stanton, CA; 714-379-7778; www.digitalpaths.net. ●●●●

A woman stands in a library filled with tall bookshelves. She is holding a white sign with black text. In the foreground, the back of a person's head and shoulders are visible, looking towards the woman. A chandelier hangs from the ceiling, casting a warm light. A wooden table with books on it is in the lower left.

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The Dish That Does More

BY MARGE AND
BRUCE BROWN

To date, attempts to bring together the worlds of computing and TV entertainment have met with limited success. The vast majority of us still watch television in the living room and browse the Web somewhere else. The new EchoStar DishPlayer 500 with Microsoft WebTV Personal TV service could change that.

The DishPlayer 500 package is a combination of hardware, software, and programming that form what EchoStar, Microsoft, and WebTV call *Enhanced TV*. Like Microsoft WebTV, the DishPlayer 500 provides Internet access, but the chief selling point is the new WebTV Personal TV service, for personalized programming and recording. If you've been considering switching to satellite TV, having the benefits of integrated satellite television content, personal TV control and customization, digital video recording, and simultaneous TV viewing and Internet access could seal the deal.

The core of the DishPlayer 500 is the satellite dish and the programming. The system includes a 20-inch dish antenna with two LNBs (Low Noise Block receiving horn with integrated Feeds) that are installed within line of sight of EchoStar's satellites. Other components include an automatic switcher that switches between LNBs (depending on the channels you request), a set-top box receiver, and a remote control. The system can receive up to 500 channels. The EchoStar Model 7200 receiver uses a 167-MHz RISC processor with 16MB of RAM, 4MB of ROM, and 2MB of flash memory. Other features are a 17.2GB hard disk, a 56-Kbps V.90 modem, and a parallel printer port.

The hardware sells for \$300 street (\$350 with an infrared keyboard). Although you can install the dish yourself, we rec-

ommend that you spend the extra \$100 for professional installation. The fee covers the wiring to a single TV set. Wiring to an additional TV costs about \$60 (a one-time charge). But if you want to view different channels on each TV simultaneously, you will have to purchase a second receiver (\$100) and pay a monthly surcharge (\$5).

Dish Network satellite programming, which includes television and digital music channels, starts at \$19.99 a month (with plenty of extra-cost movie, sports, international, and special station options). Thanks to recent legislation, satellite companies have been cleared to transmit local broadcast stations.

You also have two optional plans: WebTV Personal TV ser-

vice, which is \$9.99 a month, with features such as video digital recording, and WebTV Plus service for Internet access and interactive television programming for \$24.95 a month. If you already have an ISP, you can subscribe to WebTV Plus for \$14.95 a month (or \$10.95 a month with a \$5 discount if you also subscribe to WebTV Personal TV).

The Personal TV service en-

ables digital video recording on the included hard disk (from 8 to 12 hours, depending on content), seven days of program listings (compared with two days with regular satellite programming), unlimited "pause" of live TV, 7-second instant replay, 30-

second skip ahead, and access to three games (Doom, Solitaire, and You Don't Know Jack). With Personal TV you also get multi-speed fast forward and rewind and personalized news, weather, sports, and stock quotes. With a little practice with the digital remote control and keyboard, we quickly found our way around the system.

The most attractive feature of

If you've been thinking about switching to satellite TV, the benefits of Microsoft WebTV Personal TV service could seal the deal.

ables digital video recording on the included hard disk (from 8 to 12 hours, depending on content), seven days of program listings (compared with two days with regular satellite programming), unlimited "pause" of live TV, 7-second instant replay, 30-

WebTV Personal TV is the digital video recording capability. In this respect, the DishPlayer 500 works in a fashion similar to TiVo and ReplayTV, although Personal TV lacks TiVo's learning feature, which automatically records programs similar to those in which you've previously expressed interest.

The WebTV Plus features of the DishPlayer 500 are the same as with earlier WebTV products, including six e-mail accounts, chat rooms, and the ability to mark favorite Web sites. Currently, there are about 350 hours weekly of interactive television programming (soon to expand to 500 hours per week). A red light on the receiver tells you when you've received new e-mail messages, and you can also watch TV and surf the Internet simultaneously.

If you already have an ISP, the WebTV service offers little. But the other features of the DishPlayer 500, especially the high-quality digital video and audio programming and Personal TV service, make the package well worth the price of admission. This is one PC/TV convergence product that really could change the way you watch TV.

EchoStar DishPlayer 500 with Microsoft WebTV Personal TV service

Street price: \$350 (\$300 without keyboard) plus monthly service charges. EchoStar Communications Corp., Littleton, CO; 800-333-3474; www.dishnetwork.com. ●●●●





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Windows 2000: Network Speed Tests

Server upgrades boosted performance, but clients worked just as well with Windows 98 as with Windows 2000.

With the arrival of Windows 2000, IS professionals have some tough decisions to make about upgrading their networks. During testing for our cover story, PC Magazine Labs found that upgrading the server operating system accounts for the biggest performance gains, but changing the client operating system can have a significant effect as well. To determine the best combinations of client and server operating systems—and to test Microsoft's claim that Windows 2000 clients deliver the best network performance—we evaluated network performance using a series of client setups: Windows NT Workstation, Windows 2000 Professional, and Windows 98.

In every case, Windows 2000 Server performed better than Windows NT Server in terms of NetBench throughput. This is due to an improved SMB protocol and TCP/IP stack and improved efficiency in I/O operations.

With a Windows 2000 Server back end, both Windows 98 and Windows 2000 Professional turned in very similar peak throughput—around 375 Mbps. As the number of clients increased, Windows 98 had a very slight edge—about 5 percent—over Windows 2000 Professional. We suspect that the new operating system became bogged down on our underpowered

client PCs. The Windows NT Workstation client delivered about 10 percent less throughput with Windows 2000 Server—a peak of 337 Mbps—but was still higher in peak than any run with Windows NT Server. With Windows NT Server running on the back end, Windows 98 delivered the best peak throughput—290 Mbps. Windows 2000 came in second, at 256 Mbps. The Windows NT Workstation and Windows NT Server combination posted the worst scores, at a peak throughput of 172 Mbps—41 percent behind Windows 98.

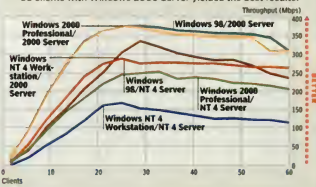
What does this mean to IS professionals deciding whether to take the plunge? Windows 2000 Server performs better than Windows NT Server and is a worthwhile upgrade regardless of the client. If you're running

Windows NT Server with NT Workstation clients, upgrade either the clients or the server (or both) and you'll likely see a tidy performance increase. To get the best performance, upgrade the back end to Windows 2000 and run either Windows 98 or Windows 2000 Professional (which, with adequate system resources, should outperform Windows 98) on your clients.


As with all benchmark programs, your mileage may vary. If your server isn't under full load, you won't see the sort of differences we report here. Also, different system configurations will deliver different results. We tested on a four-way Compaq ProLiant 7000 with 450-MHz Pentium III Xeon processors, 1GB of RAM, and a 14-disk RAID 5 array. —Russ Iwanchuk

CLIENT PERFORMANCE COMPARISON

On our NetBench tests with various combinations of server and client operating systems, Windows 2000 Professional clients and Windows 98 clients with Windows 2000 Server yielded the best results.



BICOASTAL LABS: We tested Windows 2000 both at PC Magazine Labs in New York City (upper photo) and at ZD Labs in Foster City, California (lower).



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Feedback

"Affordable digital cameras are finally moving past the point-and-shoot stage."



BACK 'EM UP

IN "BACK UP OR FIX OUTLOOK DATA FILES" (Solutions, January 18) you state, "For reasons known only to Microsoft, Outlook does not offer an easy automatic backup," adding that AutoArchive is "the only automatic backup facility Outlook offers."

This is only partially true. Microsoft released Outlook 2000 Personal Folders Backup for Office 2000 on June 29, 1999, and it can be downloaded for free from the Office Update Web site. It is a 183K add-in that automates the task of backing up the critical PST file. You can specify how often it backs up and to what directory. It also allows on-demand backup. The file can be found at <http://officeupdate.microsoft.com/downloadaddetails/pfbackup.htm>.

MICHAEL GRAY
via the Internet

AOL UNDONE

I JUST INSTALLED FOUR GRADE LEVELS of The Learning Company's excellent Reader Rabbit series, which Santa brought my kids. The kids just love them. What I don't love, however, is the five unsolicited stealth AOL icons that are now on my Microsoft Windows 98 desktop. Even McDonald's asks whether I want fries. I think it is a serious violation of a software customer's trust to install unsolicited advertising and install software for a third party's product on my system without my knowledge or permission.

JOHN ALLAN
Bright's Grove, Ontario, Canada

"RESTORE IE5'S DEFAULT APPEARANCE" (User to User, January 18, page 127) gave me the solution to a rather pesky problem. When I installed AOL 5.0 a while ago, it changed the Microsoft Internet Explorer's logo to a spinning triangle. This alone might have been tolerable, but it also added the phrase "brought to you by America Online" to the title bar of every Web page. When I contacted AOL, I was basically told to live with the problem. But then, flipping through the magazine, I found your simple solution for restoring my system. Thanks.

BRUCE STEIN
via the Internet

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ERGONOMICALLY CORRECT

JAKE KIRCHNER'S COMMENTS on the proposed OSHA ergonomics standard ("Ergonomics Regs Should Be About Bones, Not Bucks," January 18) represents the first sane assessment of the impact of ergonomics on business I've seen in any industry magazine.

Ergonomics is used to understand the capabilities and limitations of workers and to design and modify work environments to conform accordingly. The incentive to use ergonomics goes far beyond health and safety. Many companies do not publicize their successful ergonomic programs, because they consider them a competitive advantage. Savings on workers' compensation costs could pale in comparison with the benefits of the increased performance resulting from the implementation of ergonomic programs.

DENNIS ANKRUM
via the Internet

I WAS DISAPPOINTED to read Jake Kirchner's column. Many of the companies displaying what he calls "naked greed" by fighting the proposed OSHA regulation spend millions of dollars annually on ergonomic improvements in their workplaces—not because there is any law requiring them to do so but because they recognize that good ergonomics is simply good business.

Kirchner's opinion—that business puts money ahead of worker safety and "gets off pretty lightly under the proposed rules"—does not represent reality. The most successful businesses do use ergonomics to gain a competitive edge.

JACK HEISMAN
via the Internet

PRESENTING THE WEB

I ENJOYED YOUR JANUARY 18 ARTICLE on real-time Web presentations ("Show Me Now"). I am surprised, however, that you didn't mention Netpodium, which was recently purchased by Intervu. My impression is that Netpodium has been successful at providing streaming video and synchronized audio. Is it not a player in the Web conferencing market? Thanks for the article.

PAUL KNAPP
via the Internet

We considered Netpodium when planning our story on real-time Web presentations. Unlike the products we reviewed, however, Intervu doesn't offer a low-priced entry point in this category. According to the company, the least expensive Netpodium package costs \$5,000 for a 1-hour audio conference for 100 users.—Ed.

NO LONGER JUST POINT AND SHOOT

ALTHOUGH THE COMPUTER ASPECTS of the new digital cameras were covered in "Meet Your Megapixel Match" (First Looks, Janu-

ary 4), some critical photographic information was left out. Now that affordable digital cameras are finally moving past the point-and-shoot stage and becoming serious tools with real camera capabilities, keeping priorities straight is important.

When photographers (professional or advanced amateurs) shoot, they typically use filters, especially polarizing filters. This makes it possible for the camera to meter light through the lens and get proper exposure. A major shortcoming of the Kodak DC265/DC290 product line is that the light meter is on the camera body. The LCD image on any of these cameras is basically invisible outdoors, so you're left with bracketing exposures to get a good shot. This is fine if a camera is inexpensive and feature-poor but inexcusable if a camera aspires to be a serious photographic tool.

TED KURKOWSKI
via the Internet

VIRTUALLY PORTABLE NETWORK

I READ WITH INTEREST YOUR JANUARY 4 ARTICLE on virtual private networks. Unfortunately, there is one kind of user whose needs you do not address: the user who brings a laptop home, plugs it into a home LAN, and wants to use the company VPN. My employer uses Check Point's software, but I found that the SecurEmule client would kick in only when I was in the office. So I ended up uninstalling it.

ANDREW GREENE
Newton, Massachusetts

Companies are just starting to discover the problems resulting from incompatibilities between office networks and home LANs. This is one reason we suggest using standard Ethernet at home.—Ed.

WHAT'S UP, DOC?

YOUR "VIRTUAL HEALTH" ROUNDUP of medical Web sites (After Hours, January 4) covered some general issues but glossed over the main concern: How reliable is the information? Recent articles have shown that the quality of advice varies and people should be particularly careful of sites that promote or sell medication.

As a rule, sites run by medical schools (such as Harvard, Johns Hopkins, Mayo Clinic, and so on) and medical societies (such as the American Heart Association, AMA, and so on) will be the safest sites until there's some type of accreditation system. The National Library of Medicine sites (CancerNet, Medline, Pubmed, and so on) are also very good if a bit complex.

HAMISH FRASER
Maryland

WORDS-WORTH

I JUST FINISHED JIM SEYMOUR'S "THE BEST OF THE BEST" (December 14). As always, he wrote a great column. I have been using a program for my notebook for about six months called CC Copier by IMSI, from Office Max, that will solve his Encarta Dictionary problem. He can use it to put the entire Encarta Dictionary CD on his hard disk, so he'll never need the CD or the CD drive to run it again. Of course, having a large hard disk (GGB or more) also helps. Once again, thanks for the twice-a-month words of wisdom.

STEVE EPPS
Asheville, North Carolina

MEASURING INTERNET CONNECTIONS

In your online article "Test the Net with i-Bench" (www.zdnet.com/pcmag/stories/reviews/o.6755.2385204.00

Shape of PCs to Come

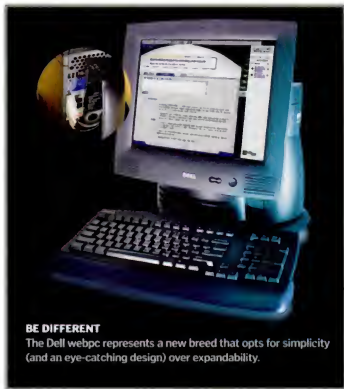
BY JOHN MORRIS

About 14 months ago, we published an annual review of desktop PCs—102 of them ("The Best PC," December 1, 1998). The days of triple-digit PC reviews are over, however. As the market changes, our coverage has to change too.

The traditional PC (a beige box containing a chip, memory, a hard disk, and other compo-

its stride. For example, the Compaq Presario EZ2000 (reviewed February 8, 2000) and the Dell webpc (January 18, 2000) are revamped PCs whose primary purpose is to get you on the Web. But at heart they are still full-fledged PCs.

Internet appliances, by contrast, offer only Web browsing and e-mail. Several startups are pioneering this market—including Netpliance



BE DIFFERENT

The Dell webpc represents a new breed that opts for simplicity (and an eye-catching design) over expandability.

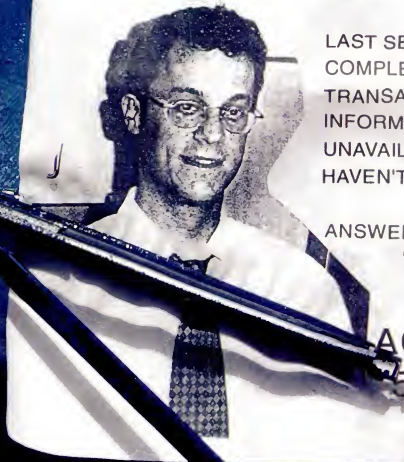
nents) isn't going away anytime soon—and neither are our comprehensive, hands-on reviews, for that matter. But as technology reaches into more parts of our business and personal lives, the concept of the PC is changing. Generalist PCs are making room for specialist PCs and other devices that are distinguished both by their designs (the Apple iMac effect) and by the tasks they perform.

At the top of the list are devices to get you on the Internet. This is hardly a new idea—WebTV Networks' first set-top boxes hit store shelves in October 1996—but it's finally hitting

(January 18, 1999), Boundless Technologies, and GlobalPC. Major online services and ISPs are also partnering with computer makers to create Internet appliances. For example, The Microsoft Network is working with Compaq Computer Corp., and America Online is allied with Gateway. Expect to see these devices around midyear.

Although Internet access is the driving force behind the creation of new types of PCs and other devices, you can also expect to see specialized devices for other applications, including PCs intended specifically for tasks such as digital

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.htm), you begin by asking a question many PC users would like answered: Which is more important for Web access, a fast pipe or a fast PC? You go on to state that i-Bench is now available to answer this question. But none of the information published as of yet gets to the heart of this question.

In the article, you show that PC performance counts a lot with an Ethernet connection (not really applicable to accessing the Web), and in a later story, you show that PC speed is insignificant when using a 28.8- or 33.6-Kbps modem connection (no big surprise). What we really want to know is the importance of pipe versus PC speed with available high-speed Internet connections, especially DSL at 256 Kbps, cable modems at 1,500 Kbps (both of which are now practical for home users), and T1 lines.

THOMAS LANGAN
Aurora, Colorado

The Ethernet numbers we reported are the T1 numbers you're looking for. The typical setup in an office has individual machines on an Ethernet network, which in turn is connected to the Internet by a T1 line. And the online testing was done using 56K modems. Unfortunately, we haven't yet done formal DSL or cable-modem testing with i-Bench, in part because the connections vary among different locations.—Ed.

DESPERATELY SEEKING

IN JIM SEYMOUR'S SIDEBAR IN "THE BEST OF 1999" (January 4, page 118), he mentions that HotLine is the best phone/contact-list manager. I haven't been able to find it through any search engine on the Net. Can you please let me know where I can find HotLine? Thanks in advance for your help.

STEPHAN G. TARANKO
via the Internet

It turns out that HotLine is no longer in existence. You are not alone in wanting to see a replacement for this spectacular product.—Ed.

HATS OFF

I AM ONCE AGAIN INDEBTED to PC Magazine's utilities. Recently, I purchased a notebook with Microsoft Windows 98. The Task Manager indicated 12 startup programs were active—too many and all undocumented. The utility Startup Cop (discussed in "Manage Your Start-Up Programs," April 20, page 192) came to the rescue. In half an hour, I'd reduced the 12 startup programs to a necessary set of 4.

DAVID J. DOLLEVOET
Mount Prospect, Illinois

Corrections and Amplifications

■ In our November 2 cover story "Send Out for Software" and in our January 4 Letters column, we ran an incorrect Web site address for ADP's EasyPayNet service. The correct URL is www.ebs.adp.com.

■ In our January 4 cover story, "Best Products of the Year," we incorrectly stated that the Micron Millennia Max 533, our favorite home PC of 1999, comes with Sonigistix Monsoon MM-700 flat-panel speakers. Those are actually a \$149 upgrade over the standard Advent speakers that come with the system.

■ In our review of Check Point Software's VPN-1 Gateway ("Virtual Private Networks," January 4), we stated that Check Point's ConnectControl provides load balancing and fail-over protection across multiple VPN-1 servers. In fact, ConnectControl provides Web server fail-over only. We also stated that all management tasks must be done from the PC on which VPN-1 Gateway is running. In fact, the management interface can run on any host on the network.

■ In our review of football game CD-ROMs ("Kickoff Time," After Hours, January 18), we switched the screen shots for Madden NFL 2000 and NFL Fever 2000.

SECOND LOOKS

audio or home entertainment. We've even seen systems designed exclusively for video editing such as the Apple iMac DV Edition and the Applied Magic ScreenPlay. On the gadget front, this year should bring hand-held devices that better integrate the functions of a PDA with wireless access.

As our readers note, for most users these new types of PCs and devices will supplement—not supplant—traditional PCs. Internet appliances are a fine option for those who want easy

Internet access and e-mail only. But most will want to have both a full-featured PC at work or in the study at home and an Internet appliance in the kitchen or family room. Similarly, at work many users will want both a desktop or laptop PC and a simpler, wireless device for accessing e-mail and the Web from wherever they are at any given time.

The good news is that you'll have all of these options to choose from and more in the coming year.

Tell us what you think.... How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product each week and summarize your comments here. Following are some comments from our online discussion on Internet appliances. www.seconlook.com

Dell has reached a new low with the webpc. PCs were supposed to be versatile machines that could adapt and grow (be upgraded) to meet future challenges. This contraption of Dell's is an overglorified calculator with a USB port. I suppose it is perfect for the 10 percent of our country's population that uses a PC solely for e-mail and online chat. A legacy-free PC only contributes to the dumbing down of America. —ALEX OLSON

There's nothing wrong with a legacy-free PC. If I were buying my first PC, I'd buy a legacy-free one. What need do you have for ISA slots or even a parallel port if you don't have old peripherals? What I would want, however, is to be able to get at the insides, so that I could add my own Ethernet card, graphics and sounds cards, and SCSI adapters. If you buy an all-in-one PC, you've got to be content with the components that come with it.

—MIKE EDVINO

I think there will be two main types of PCs: the traditional PC and a portable device with wireless access. The PC will surely live on. Not everyone uses a PC for only word processing and e-mail, and a full-fledged PC is especially useful for games, 3-D animation, and other processor-intensive tasks. On the other hand, when we travel, a wireless-access device will be plenty. Such a device should weigh less than 2 pounds (less than 1 pound would be even better), be no bigger than a 3Com Palm V, and have cell phone, PDA, and wireless Internet-access capabilities. The main point is that there won't be one be-all-and-end-all device for everyone. Consumers like choice, and this is what they'll continue to have in the next five to ten years.

—DENNIS DEVEAUX

Why having an Internet appliance instead of a PC? I'm placing bets on both technologies in one. Wireless Internet access will kill the desktop PC. My next computer will look like an Etch A Sketch.

—GORD

I'm a PC user through and through, but I may get one of these gadgets for my parents, who are curious about the Internet but don't need the power and hassle of a PC. I wonder if I'll have to wait longer than six months.

—DAN WILSON



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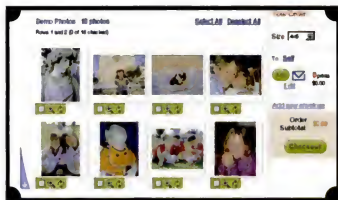


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Pipeline

DISPATCHES FROM THE WORLD OF COMPUTING



Photography Develops Online

The Web offers easy finishing for digital snapshots.

Now that digital cameras are improving in quality and dropping in price enough to attract millions of mainstream consumer shutterbugs, an important question arises: How will all those people turn their digital snapshots into paper prints?

The answer, of course, is on the Web, where a dozen or more online photo-finishing sites are jockeying for position in anticipation of the day when digital cameras match old-fashioned 35-mm point-and-click cameras feature for feature and dollar for dollar. Ten percent of the \$34 billion photo-finishing market is expected to move online by 2004, according to Lyra Research.

Though online photo sharing is already a hobby for legions of people, few people have taken the extra step of "developing" their digital images into prints on high-quality paper.

Two new services, Ofoto and Shutterfly.com (shown above), both strive to make uploading photos and ordering prints as simple as buying books at Amazon.com. Unlike many other photo-finishing sites, such as PhotoAccess.com, Ofoto and Shutterfly.com have their own photo-finishing facilities. The advantages, they say, are speed and quality control. Both companies

feel that the potential market for high-quality prints is huge.

Ofoto has jump-started its business by offering 100 free prints to the first 1 million people who sign up and establish online photo albums. Each album comes with its own URL, so you can alert your friends and let them have a look, at which point they can ▶

Who's Making The Big Bucks?

SALARIES for IT PROFESSIONALS are on the rise, demand for their services remains strong, and networking is the hottest job in the IT field, according to a recent survey from RHI Consulting of over 1,400 U.S. CIOs.

For recruiters, the market remains tight, with an oversupply of jobs and a lack of trained people to fill them. Consequently, companies have to focus not only on hiring competent staff but also on finding ways to retain them in the light of tempting outside offers. No easy task, considering average turnover rates are near 20 percent.

Based on responses from the CIOs surveyed, starting salaries for IT professionals in 2000 are expected to increase an average of 6.8 percent over 1999, with specialists in systems integration enjoying the greatest rise in compensation. Starting salaries in this field are projected to increase by more than 17 percent over last year. Internet professionals as a group will see an average starting salary increase of 7.2 percent, but e-commerce specialists within this category will see hikes of 14.8 percent.

Emerging technologies such as Linux are also expected to increase the need for experi-



IT's HOTTEST JOBS

When asked which specialty areas are experiencing the strongest job growth, CIOs chose:

- **Networking**
- **Help desk and end-user support**
- **Internet and intranet development**
- **Applications development**

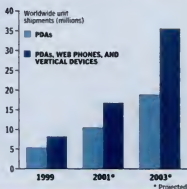
Source: RHI Consulting, based on a survey of 1,400 CIOs in the U.S.

enced network engineers. When asked what trend will have the greatest effect on the IT industry in the next two years, the CIOs surveyed identified e-commerce. The number of jobs for Web administrators skilled in managing Internet and intranet applications is also expected to rise.

So how can companies hold on to their IT staffs? Higher salaries are just the tip of the iceberg, says RHI. These days, employee satisfaction requires training, flexible hours, stock options, casual offices, performance-based pay, and signing bonuses.

Thumbs-Up for Hand-Helds

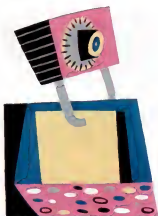
Palm devices continue to dominate the PDA market, which research firm IDC expects will soar to almost 19 million shipments in 2003. Sales of Web-enabled mobile phones were almost 40 percent under the forecast last year, but shipments are expected to increase to 12.9 million units in 2003.



Source: International Data Corp., 1999.

MORE ON THE WEB: ■ E-COMMERCE IN 3-D ■ THE WEB-BASED SUPPLY CHAIN ■ FREE DSL ■ PLUS: EXPANDED VERSIONS OF THE STORIES IN THIS SECTION www.pcmag.com/pipeline

A Firewall of One's Own



IF YOU'VE GOT BROADBAND Internet access, you have a few more security worries than your neighbor with the 56-Kbps modem. If you're connected day and night, you're prone to all sorts of attacks from hackers. The threat may not seem that great now, but according to market research firm Current Analysis, one in ten high-speed Internet users will experience a hacker attack.

Software products such as BlackICE Defender can protect your system from attack, but the latest offerings further simplify security. Nortel Networks and its Shasta IP Services division are giving Internet service providers the capability to configure personal firewalls for their cable and DSL modem customers. Nortel recently launched Secure Cable, an anti-hacking system that uses network-based firewalls to protect each cable connection. Nortel supplies cable modem solutions to companies including AT&T Cable Services, Cablevision, Cox, GTE, and Time Warner.

Meanwhile, Check Point Software and Texas Instruments are developing personal firewall technology that will be built into the silicon components of cable and DSL modems. Based on Check Point's Stateful Inspection technology, the HomeSecure! software will be designed initially on Texas Instruments' cable modem platform.

Photography Continued

annotate the photos with their own comments and order prints for themselves (\$0.49 for a regular 4- by 6-inch print, \$0.99 for a 5- by 7-inch print, and \$2.99 for an 8- by 10-inch print).

Shutterfly.com, helmed by Netscape cofounder Jim Clark, offers similar services, though it charges more for large prints (\$1.99 for 5- by 7-inch prints and \$4.99 for 8- by 10-inch prints). Unlike Ofoto, Shutterfly.com has convenient drag-and-drop upload, calibration with popular digital cameras, and a free service that lets you print custom messages on the backs of prints.

Web Idea Auctions

Think online auctions and you probably think of collectibles—rare books, sports memorabilia, and antique toys. But auction sites are evolving far beyond the buying and selling of goods that can be packed in a box and delivered to your doorstep. They're spreading out into more intangible territory, where intellectual property, professional services, and even entire businesses are bought and sold.

These days you can head to several sites to bid for professional services as well as commercial goods like printing and trucking ser-

INTELLECTUAL EXCHANGES



At these online marketplaces, employers can post project proposals and free agents can bid on contracts.

Collab.Net www.collab.net
eBay www.ebay.de
eLance www.elance.com
Guru.com www.guru.com
HelloBrain.com www.hellobrain.com
Monster.com www.talentmarket.monster.com
Niku www.niku.com
Opus360 www.opus360.com
WorkExchange.com www.workexchange.com

vices. With an eye to delivering professional services, Web entrepreneurs are setting up shop as technology talent auctioneers.

Likened to an eBay for intellectual capital, newcomer HelloBrain.com promises to connect technology pros with companies looking to outsource their IT work. Need an algorithm for real-time audio compression? Post the fee and a description of the problem. Wait for a "contributor" to accept an offer, figure out a solution, and e-mail you the answer. Technology professionals can also post their ideas and areas of expertise, aiming to attract companies in need.

Suppose a company wants to create a Web site and is in search of artists, animators, programmers, and database experts. A company can visit HelloBrain.com and ask for a virtual team to bid for the job, or it can separate the project into various subtasks.

HelloBrain.com provides tools for online collaboration, evaluation, verification, delivery, and security. CEO Bharat Sastri expects to deal with a wide range of technology problems and solutions, including everything from software to chip designs.

Other sites offering similar services include Collab.Net, eLance, Guru.com, Monster.com's Monster Talent Market, Niku, Opus360, and WorkExchange.com. Going a step further than these online service marketplaces, eBay's German operation, eBay.de, recently sold an entire company to an online buyer.

This issue's contributors: Carol Levin, Sharon Nash, Alfred Poor, Sebastian Rupley, and Don Wilmott.

New Flat Panels

THE PRICE OF LCD PANELS IS dropping, but the displays still cost more than traditional monitors. One reason is the slow, expensive manufacturing process. LCD panels use fragile and expensive thin glass with a silicon coating on which transistors are created. The entire panel must be processed before defective transistors can be identified.

Now, Alien Technology has developed a manufacturing method called *Fluidic Self-Assembly* (FSA) that efficiently produces transistors and then places them only where they're needed in the display.

FSA begins by making millions of transistors on standard CMOS chips and carving them into tiny nanoblocks. The blocks are suspended in a liquid, which is poured over a surface with nanoblock-shaped holes. The blocks fit in the holes, and any excess blocks are recovered and reused. The technology works with glass and plastic panels.

Top Travel Sites

1	AOL Travel Channel (www.aol.com/webcenters/travel)
2	Expedia (www.expedia.com)
3	Mapquest.com (www.mapquest.com)
4	Travelocity.com (www.travelocity.com)
5	Preview Travel (www.previewtravel.com)
6	Southwest.com (www.southwest.com)
7	AA.COM (www.aa.com)
8	United Airlines (www.ual.com)
9	CheapTickets.com (www.cheaptickets.com)
10	Delta Air Lines (www.delta-air.com)

Source: Media Metrix, November 1999.

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The PF97 is 19" (18.0" viewable) with a .25mm aperture grille pitch at the center and .27mm dot pitch at the corners. The PF77 is 17" (16.0" viewable) with a .25mm aperture grille pitch. Both are backed by ViewSonic's 3 year limited warranty plus 24-hour customer service, 7 days a week.

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JAKE KIRCHNER

Internet Tax Blues



ONLINE SALES FOR THE RECENT HOLIDAY SEASON were, by any measure, boffo. Estimates have sales topping \$10 billion, or more than three times the sales figure for 1998. Newspaper headlines focused on the few toys that failed to arrive in time for Christmas, but overall, the only people really disappointed were state and local tax collectors.

The tax authorities' inability to collect the hundreds of millions of dollars in sales taxes that would otherwise have been generated by such economic activity surely had them feeling blue and looking forward to this spring, when Congress takes the next step in its consideration of Internet taxation. The Internet Tax Freedom Act of 1998, which imposed a three-year moratorium on any new Internet-related taxes, particularly on Internet access fees, created the Advisory Committee on Electronic Commerce, which is set to report back to Congress in April.

Besides access-fee taxes, the sales tax issue is the most vexing one for states and local governments. Some states get more than half of their revenues from sales taxes. Beyond the hundreds of

billions of dollars of annual online sales anticipated in the next few years, Internet-generated economic activity (particularly business-to-business) is expected to total trillions of dollars a year by 2002.

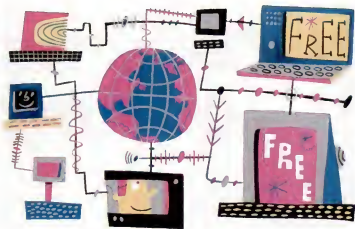
With this much money on the line, it's no surprise that the debate is growing. Online retailers and businesses want the government off their backs; state and local governments want fairness and tax revenues. The current moratorium results from Congress's conviction that a rush to taxation would stifle the Internet boom. As the moratorium ends and the Internet era flourishes, that concern won't be paramount. Assuaging state and local concerns without overburdening online businesses will become the focus.

Some states already try to tax sales to their residents from non-brick-and-mortar retailers, such as catalog merchants and telemarketers. Some require the sellers to collect the taxes; others insist that customers report and pay sales tax on their own for items they buy untaxed out of state. Neither approach is efficient—or likely to be satisfactory as online commerce grows. Meanwhile, established local merchants decry the unfairness and hardship of having to collect taxes that their online competitors do not.

Personally, I don't know why the mom-and-pop bookstore in my village has to suffer a greater tax collection burden than Web mega-mart Amazon.com, but I prefer to see the burden of the small retailer reduced rather than have it imposed on Internet giants.

Those of us who buy things online and those of us who build consumer and business sites—in other words, every last one of us—can't realistically expect to escape taxes on the Internet. But we can expect the solution to this technology-generated problem to come via a technology-reliant tax collection process. Companies like esalestax.com, NationTax Online, Taxware International, and VerTex are developing server-based products that can automate the process and reduce the administrative burden of any new taxes on Internet commerce. Their wares won't make taxes any more welcome, but perhaps they will make the process a bit fairer.

Those of us who buy things online can't realistically expect to escape Internet taxes.



Surfing Free

WITH THE ARRIVAL OF THE NEW millennium, free Internet access is gaining momentum. Market research firms Datamonitor and Dataquest are predicting that this year will usher in the era of free Internet access that many technology pundits have been predicting for years.

"The year 2000 will be the year of free, private-label service," says Datamonitor analyst Rob Shavell. According to Datamonitor, customer growth for e-commerce sites is now so strategically important that commerce sites need to seek partnerships with ISPs. ISPs, too, are in a competitive environment where they must seek revenue sources other than subscriptions.

"AOL will be forced to offer free service," Shavell says. "The only thing holding back older AOL

users from switching to a free service may be the pain of losing their e-mail addresses," he adds. AOL officials say that its vast content offerings and ties to the Web will continue to create compelling reasons to subscribe.

Dataquest analysts also say that more U.S. consumers will expect free Internet access in the near future. "While it's unlikely that U.S. households will migrate en masse to free access providers, the growth in households with free Internet access will accelerate due to the intense competition for the remaining new subscribers and the need to retain existing subscribers," says Dataquest vice president Harry Hoyle.

Junio and NetZero already offer free Internet access. Broadband Digital Group plans to offer free DSL service starting April 1.

A New Spin On Washing Machines

The Merloni Margherita-2000, from Italy's Merloni Elettrodomestici, can download new washing programs from www.margherita2000.com and report faults to a service center. Another convenience: You can turn it on and off via cell phone or the Internet.





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Wiring the Heartland

WHAT DOES WAL-MART HAVE THAT AOL wants? Quite a lot, apparently. The cross-pollination between established, brick-and-mortar retailers and online services has become frenzied recently, with several deals underway.

Wal-Mart and AOL recently teamed up to market a new



Internet access service to small-town America, where local Internet access service isn't necessarily available. Currently, only six out of every 10 towns with Wal-Mart stores have Internet access via local dial-up. The companies plan to offer a co-branded, low-cost ISP, and Wal-Mart will promote AOL's services in its more than 2,900 stores. AOL has also paired up with Circuit City to promote AOL services in Circuit City outlets.

This marketing strategy is catching on. Microsoft plans to invest \$200 million in Best Buy in return for promotion of its MSN Internet service. Meanwhile, Kmart and Yahoo! recently launched a free ISP and online store, BlueLight.com.

Microsoft also recently struck an Internet deal with RadioShack, through which a Microsoft "store within a store" will be featured in each of RadioShack's 7,000 locations. Customers can view demonstrations of and sign up for MSN dial-up or broadband Internet access. In turn, Microsoft is helping RadioShack build its Web site into a leading e-commerce site.

Gaming Showdown

This year is shaping up to be a battle of the gaming consoles, with Sega and Sony duking it out for popularity among gamers and a potentially lucrative share of the burgeoning online gaming market. Sony is preparing to release its PlayStation 2 gaming console in the second half of the year, while Sega is making moves to build on the success of its Dreamcast console.

Sega's Dreamcast Network has entered into an agreement with Excite@Home to become "portal partners." Excite@Home will provide custom content and a dedicated site for Dreamcast owners and players. As part of the agreement, Excite@Home will develop content to be viewed on a television screen through a Dreamcast browser. The deal is designed to capitalize on digital set-top boxes that will allow for multiplayer online gaming using a browser displayed on a television screen.

The Dreamcast Network won't support online gaming until the second half of 2000, around the time that Dreamcast may have significant competition in the U.S. from Sony's PlayStation 2.

Sega's arrangement with Excite@Home, however, is an effort to get a jump on the trend toward online multiplayer gaming, which may have profound implications for the Internet, advertising, television, and gaming itself. Market researchers at the Interactive Digital Software Association expect that there will be 26.8 million online game players by 2002, with many



Back-in-Print Books

OUT-OF-PRINT BOOKS MAY SOON be a thing of the past. Barnes & Noble has teamed up with IBM to provide print-on-demand facilities at book distribution centers. As a result, the bookstore will be able to provide many more books than it does now, with no additional inventory space required.

"This will allow us to bring back into print titles whose low sales prohibited stores from keeping inventory on the shelf," says Ken Brooks, vice president of digital content for Barnes & Noble, which sells almost 1 million titles.

Printing a single copy of a book should take less than 5 minutes. The first facility will be in Jamesburg, N.J., and is expected to be ready by the spring.

The technology for this type of printing has been available for quite some time, but the print quality has only recently caught up with high-speed digital printing techniques. In 1997, IBM formed a partnership with Ingram Book Co. for a service called Lightning Print, which stores books in a digital library and prints each book one at a time, as ordered by retailers.

The Barnes & Noble deal will bring on-demand printing to the mainstream. "Our new deal with IBM will enable us to convert massive amounts of content in a fast and efficient manner into high-quality printed and electronic books," says Steve Riggio, vice chairman of Barnes & Noble.

A Month in the Life of a Web Surfer

Advertisers eat up all the data they can about how people use the Web, and Nielsen/NetRatings takes their collective pulse every month. Based on a December sampling of Internet households, over 119 million people had access, of which 74 million people surfed the Web.



Online sessions: 17
Time online: 8 hours, 17 minutes
Sites visited: 9
Duration of page view: 55 seconds
Duration of surfing session: 29 minutes



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SONY

Sony's Play-Station 2 will be released in Japan in March, then in the U.S. later this year. Sony execs expect the PlayStation 2 to sell 1 million units in the first week. They have also signed up over 100 software partners to develop games. The availability of software titles will be critical in the PlayStation/Dreamcast battle.



Sega's Dreamcast, shipping now, features graphics capabilities on a par with those of PCs. In partnership with Sega, Excite@Home will provide custom content at a Web site for Dreamcast owners. The company will also provide content to be viewed on a television screen via a Dreamcast browser.

In Search of Sound and Video

COMPAQ IS UP AND RUNNING with a new Web site that lets you search for and retrieve audio files, joining a growing number of sites, such as the Media Search Engine at AltaVista, designed for searching streaming media.

The company's SpeechBot site indexes over 2,000 hours of audio, so site visitors can easily search for audio clips. The site has archived radio programs from the Motley Fool personal finance site, National Public Radio's Fresh Air and Talk of the Nation, and other programs.

Searchable video is also gaining momentum on the Web. Most search engines today just look for text, but a small San Mateo, California, company called Virage is helping a number of partners implement search-

able video on the Web. Its partners include AltaVista, The New York Times, and other sites.

Virage's VideoLogger is designed for coding and accessing video content. The application uses image analysis algorithms to track significant visual shifts (such as pans and zooms) and code indexed segments of a video stream. When an embedded text transcript is synchronized with the coded video keyframes, keywords can be used to search an entire video broadcast.



Game Consoles Continued

of those gamers seeking multiplayer competition on the Internet.

Sony plans to release the much-awaited PlayStation 2 console in Japan in March 2000, at a price of 39,800 yen (around \$390), the same price that the original PlayStation sold at when it was released. The console will ship in the U.S. in the fall of this year. Sony executives say they expect PlayStation 2 to sell 1 million units in its first week of availability, and that well over 100 software partners have signed on to develop titles for the PlayStation 2.

Sony is also planning to offer Internet distribution of gaming content through the PlayStation 2 (which will ship with a built-in modem) in 2001. The strategy will eventually incorporate a broadband distribution network, enabling players to download new titles quickly and pay for them online directly from their PlayStation 2 consoles.

In addition to a modem, the PlayStation 2 will feature a DVD-ROM drive, Dolby Digital and Digital Theater System sound, 32MB of memory, and IEEE 1394 (FireWire) and USB technology. "With PlayStation 2, we want to chart a path toward the future of networked digital entertainment," says Ken Kutaragi, president and CEO of Sony Computer Entertainment.

Industry analysts expect the upcoming competition between Dreamcast and PlayStation 2 to be fierce. The availability of software titles and the efficiency with which the platforms move in the direction of rich, online gaming experiences will be key factors in the showdown.

Ready for the Y2K Aftermath?

AFTER ALL WAS SAID AND DONE, businesses around the globe laid out \$282 billion in finding, replacing, rewriting, testing, and documenting computer code with two-digit date fields in preparation for the new millennium, reports market research firm IDC. Some estimates are as high as \$600 billion.



The efforts averted a cyber-meltdown, but IDC analysts say that businesses overspent on fixing and preparing for the Y2K rollover. In particular, businesses

overspent on salaries for the extra staff on hand over the New Year's weekend, on labor and overhead for contingency planning, and on Y2K remediation.

IDC now predicts that Y2K bugs are still lurking and could lead to computer downtime in coming months as companies grapple with billing and record-keeping glitches. These problems, according to IDC analysts, could take an estimated \$21 billion bite out of the global economy this year.

Web Popularity Club

At AltaVista last year, over 90 percent of the top 20 search terms were entertainment-related. A Jupiter Communications survey reports that 42 percent of consumers spend less time watching TV because of time spent online. Here are AltaVista's most frequent entertainment search requests of 1999.

 2 Chat	 3 Pokemon	 4 Pamela Anderson
 5 South Park	 6 Games	 7 Britney Spears
 8 Star Wars	 9 Jennifer Lopez	 10 Ricky Martin

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— Fred Lugano, weatherization.com, Vermont

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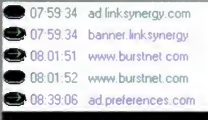
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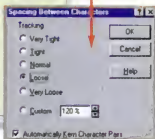
**WordArt Step by Step**

You can create a professional-looking logo by following these steps:

Step 1. Select the WordArt tool and draw a frame. Enter the company name.

Step 2. Using the WordArt toolbar, apply the *Arch Up (Curve)* shape, the *Felix Titting* font, and the *Best Fit* size. Make the text bold, and shade it with the *Olive* color. Choose the *Center Alignment* option, and the *Loose* option for *Spacing Between Characters*. Open the *Special Effects* dialog box and adjust the curvature of the arc to 70 degrees. As a final touch, apply a beveled black shadow.

Step 3. Draw a second WordArt frame, and enter the rest of the company name. Make the text bold, color it black, and set the *Spacing Between Characters* to *Loose*. In Publisher's workspace, use the arrow tool to center the word *Technologies* below *Archimedes*.



Create Logos

Design company and other logos using a tool you probably

Step 4. To create the curved line above the word *Archimedes*, draw a third WordArt frame. In the WordArt text box, type 15 underline characters. In the *Special Effects* dialog box, change the arc angle to 60 degrees. Use the arrow tool to center the curved line above the word *Archimedes*.

Step 5. Import a clip art symbol. To frame the clip art, draw a circle. Fill the circle with solid white and apply a 1.25-point black border. Send the circular border behind the clip art image, then select both objects and use the *Align* command to place the clip art in the center of the circle. Group the objects and move the group to the center of the curved line.

Step 6. Open the *Recolor Picture* command to apply the same color to both the *Archimedes* WordArt element and the imported clip art image. Select the option that leaves the black parts of the picture unchanged, then define a custom RGB color where red is 153, green is 153, and blue is 0. This color is very similar to the *Olive* color in the WordArt dialog box and has the added benefit of displaying properly on the Web.



Businesses large and small alike use typographic designs for corporate letterheads, conference communications, and even logos for the company softball team. Oddly enough, most users are unaware that if they own Microsoft Office, they already have the ability to create text-based logos using its included WordArt miniprogram.

The WordArt tool lets you mold text into geometric shapes, align it along arcs or circles, and create unusual fill or shadow effects. Unlike full-featured drawing programs such as Corel Draw or Adobe Illustrator, WordArt doesn't require you to be an artist or to understand the intricacies of kerning and baseline shifts. WordArt's effects are achieved through simple drop-down menus and dialog boxes.

Creating a WordArt logo is a simple process: Step 1: In Word, choose *Insert* | *WordArt*, or in Publisher, choose *Insert* | *Object* | *Microsoft WordArt*. Step 2: When the WordArt toolbar and text-entry box appear, type your copy. Step 3: Use the toolbar to apply special effects to the text. Step 4: Click anywhere outside

WordArt makes it easy to size, space, and align multiple text elements. You can resize the text elements interactively simply by resizing the WordArt frame. More importantly, when we applied the *Letter Justify* alignment option to the word *Construction*, WordArt automatically added the appropriate amount of space between each letter to space the phrase evenly across the frame.

RESHAPE TEXT

Because WordArt treats type as vector outlines, it can modify the shape of a letter or the shape of the baseline along which text flows. This ability to twist and turn letters lets you match any text phrase to the shape of underlying geometry.

The most common example of this is text running around a circle. In Figure 2, the shape of the globe provides a perfect circle around which we wrapped the name of a conference. But WordArt's drop-down menu offers a wide variety of shapes, including, arcs, triangles, convex or concave lenses, wavy banners, and

Using Card Stock with Publisher

I want to print a card I've designed with Microsoft Publisher on card stock. I have defined a custom paper size for my printer, but Publisher doesn't recognize the custom paper size when I choose it in the *Print Setup* dialog box.

DAVE ZEISS
Lafayette, Colorado

You've discovered a long-standing bug in Publisher. Choosing a custom paper size from within Publisher's *Print Setup* dialog box never works properly. Luckily, the workaround is simple. Open the *Print* dialog box instead. Then click the *Properties* button (which appears next to the printer drop-down list). In the printer's *Properties* dialog box, choose the custom paper size you've defined and then click *OK* twice to return to your document. Publisher will display the page at the proper size in the work area, and more importantly, it will print your card correctly.—LS

Get the Previous Record's Data

I'm trying write a program that accesses data in the previous record, using code from Microsoft's Knowledge Base. I copied the code into my Access application and tried it at the Report, Form, and Module levels, but it won't work. The best I can achieve is a #Name? error.

F. D. FARMER
Vancouver, B.C.

#Name? errors occur when a field has the same name as a control. When you add a field to a form, Access creates a text box control and assigns it the same name as the field. If you leave the name that way, ambiguities arise when Access tries to determine whether you're referring to the field or the control in your expressions.

Because of this, changing the control's *Name* property to something different from the name of the field is always a good idea. For example, one common technique is to append the prefix *ctl*, so that the text box for a field named

in WordArt

already own. **By Luisa Simone**

the WordArt frame to return to the program's normal operating mode.

WordArt does have a few limitations. It relies on TrueType fonts (PostScript fonts are not supported), and the text can only be formatted with a single font and a single effect. So if you want a logo to contain multiple fonts at different point sizes, you'll have to create several different WordArt objects and group them together.

We can't give you a formula for logo design, because the best logos begin with old-fashioned inspiration. However, we can run through a few design techniques.

ALIGN ELEMENTS

When you begin your logo design, you should look for meaningful relationships between individual elements. A company name often contains primary and secondary words that suggest a corresponding visual relationship. In Figure 1, we created a logo where the most important word is big, and the supporting text is small. Nevertheless, the logo is clearly a single, cohesive unit, because the secondary text element is as wide as the word above it.

perspective rectangles.

If you want a professional-looking logo, you'll have to tweak the effect. Even in Figure 2, which is a straightforward circular wrap, we found it necessary to rotate the text 35 degrees and to add a bullet symbol between each word in order to keep the text legible.

Our opening, step-by-step example is a more sophisticated version of Figure 2. Instead of wrapping text around a circle, we flowed it along an arc. In Publisher, the *Special Effects* dialog box can flatten the arc (from 180 degrees to 70 degrees) in order to produce a more subtle elliptical shape. In Word 97, you can rotate the text using the *Free Rotate* tool and flatten the arc by resizing the frame containing the text.

ENHANCE TEXT WITH FORMATTING

All three of the logos shown here take advantage of WordArt's formatting attributes. On the simplest level, you can change the color of text. But, as shown in Figure 2, the ability to change the fill color separately from the outline color opens up a world of design possibilities. In this case, we filled the text with light blue, but defined the type with a black outline.



FIGURE 1: One strategy for creating a logo is to align two words of different lengths.

OFFICE SOLUTIONS

OrderID would be called **ctOrderID**.

For information on how to refer to fields in a previous record programmatically, see the Solutions column www.zdnet.com/pcmag/pctech/content/solutions/db1718a.htm from PC Magazine's issue of October 20, 1998.—*Sal Ricciardi*

Inserting Today's Date in Access

Is there a way to create a macro to insert today's date in a date field in Access?

STEVEN SAYCE
via the Internet

There's no need for a macro that inserts the current date. Access as shipped has a shortcut command for inserting the date: **Ctrl+;(semicolon)**. Simply move to the appropriate field and type the shortcut. A related shortcut worth mentioning is **Ctrl+:(colon)**, which inserts the current time.—*M. David Stone*

The sample logos here also illustrate the range of WordArt's shadow effects. The Meehan logo employs a cast shadow effect to give the text a 3-D quality. The shadow in our Archimedes example looks more like embossing, because we chose a beveled shadow and changed the color to black. Though all of these effects add visual complexity, they are easy to apply.

We also applied more subtle formatting attributes to these text elements. For example, we loosened the letter spacing in the Archimedes logo to make the type more legible. And, in several instances, we boldfaced text elements to give them a little more weight.

ADD DRAWN SHAPES AND CLIP ART

Even logos that consist primarily of text will often need supporting images. Microsoft Office provides an extensive clip art collection, easy mechanisms to import pictures from other sources, and simple drawing tools.

Clip art pictures—especially if they're generic enough to be read as abstract symbols—can greatly enhance a logo. Our sample logos pro-

vide a useful demonstration of this. In one case, the image of a globe provides the unifying shape for the logo and plays off a word in the text. In the other, a small, roughly drawn design adds a visual accent that echoes the archaic reference in the company name.



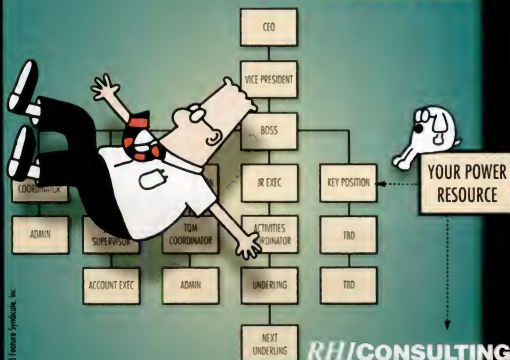
FIGURE 2: You can change the text baseline's shape; in this case, we used a circle.

You'll often find that a simple geometric shape is all you need to give structure to a logo. In the Meehan Construction logo (Figure 1), we added a dark rectangle as a background for the small white text element. The rectangle also serves as a visual anchor for the design. Likewise, the Global Marketing logo in Figure 2 contains two additional circles filled with light blue gradients. And the Archimedes logo contains a curved line that mimics the shape of the text arc.

With some practice and imagination, you can do a lot of wild and wonderful things with WordArt. The crib sheet shows three of our favorite ways to get even more of a design bang out of this little utility.

Luisa Simone is a contributing editor of PC Magazine.

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Remotely Control Your PC Over the Internet

It's usually the cheapest way to use your PC from afar, but there's a trick.

By M. David Stone

Remote-control programs such as Carbon Copy, LapLink, NetOp, and pcAnywhere let you connect to your host computer over a direct cable, a LAN, a phone line, or the Internet. The last choice has the advantage, because you can use your office system from just about anywhere with a local call, instead of having to pay long distance phone charges.

The hard part is that the remote system needs to know the host's IP address in order to connect. This is not a problem in a large corporation with a permanent Internet connection such as a T1 line, or even in a small business connected permanently by a fractional T1 line, cable modem, or DSL. In these situations, you have the same IP address at all times.

But there's a problem if you connect by modem. ISPs usually assign a different IP address every time the modem connects. Before you can use remote-control software over the Internet, you have to know the host's IP address.

The good news is that even if your main system connects to the Internet strictly by modem, you can still take advantage of remote control over the Internet.

There are four possible situations, depending on two factors: First, you may be using a program

like pcAnywhere 9.0, which offers special features that make finding a host's IP address easy. Alternatively, you may be using a program—including earlier versions of pcAnywhere—that doesn't help you find the host's IP. For both of these possibilities, you may or may not be able count on someone being in your office when you need to connect.

In this article, we'll discuss the strategies available for connecting in three of these four situations. The fourth—connecting to a system when no one's in the office and with no feature in the program to help you find the host over the Internet—is not worth wasting time on. You're better off upgrading to a program that provides the support to help you find the IP address.

We won't discuss establishing a connection, since this depends on your specific program. You should be able to get this information from the software vendor in any case. You should also check with the program vendor for hints on keeping your office system secure when it's logged on to the Internet and waiting for a call.

IF SOMEONE IS IN THE OFFICE

Knowing that someone will be in the office when you call means not having to worry

Multiple Attachments in Outlook Express

How do I send more than one attachment in an e-mail using Outlook Express 5?

MARTY GOLD
Marac, Florida

While composing the message, select **File Attachment** from the **Insert** menu. If the files you want to attach are all in the same folder, you can select them all at once. To select a continuous range of files, click the first, then hold down **Shift** and click on the last. To select or deselect individual files without affecting the selection status of other files, hold **Ctrl** while clicking on them. If the files are not in the same folder, just select one, click **OK**, and choose **File Attachments** from the **Insert** menu again, as many times as necessary.

Some of your correspondents may have limits on the size of the e-mail messages they can receive. If the files you want to send are very large, it may be better to send them separately.—Neil J. Rubenking

Why No FTP Over a Fast Connection?

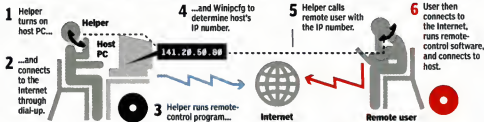
I use FTP to upload and download files from a site that was set up specifically for me, but I can no longer see the directories on that site when I connect from home. That is, I can't when I use a high-speed connection (dial-up connections work fine). The FTP client connects, but then it tells me it didn't receive a command. Any idea what's up?

NIGEL THOMAS
via the internet

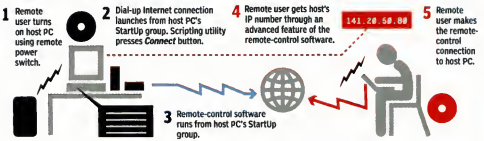
What's up, quite possibly, is that your high-speed Ethernet card is going through a firewall and the firewall doesn't let the transaction take place. In some FTP clients (the popular WS-FTP, for example), you can set the configuration to use *passive transfer* mode. In this mode, the client is responsible for establishing the FTP connection, a duty normally handled by the server (it reverses the role of initiator and listener

REMOTE CONTROL OVER THE INTERNET

Scenario 1: Someone is at the host PC (home or office) to assist in making the connection.



Scenario 2: No one is in the home or office to help with the connection.



for the FTP protocol). If this doesn't help, try a different network card.—Neil Randall

Blind Copies in Outlook Express

Is there any way to send a message to multiple recipients in Microsoft Outlook Express without everyone seeing everyone else's addresses?

RICHARD VICANTE
via the Internet

What you're looking for is called a blind carbon copy, or BCC, option. To use BCCs in Outlook Express 5, start a new message and choose **View | All Headers**. This will add a BCC line just under the CC line in the header, and will turn the feature on for all future messages unless you choose **View | All Headers** again to turn it off. Any e-mail addresses you enter in the BCC line—separated by commas or semicolons—will not show in received messages.—MDS

Avoid Restarting Windows

Whenever I log onto my company network from home, I have to change the TCP/IP settings (DNS servers, gateway server, and so forth) in **Control Panel | Network**. After I log off, I change things back so that these settings are reset automatically by my ISP (that is, I blank all the TCP/IP settings). Of course, this means I have to restart Windows in each case. Is there any way around this constant restarting?

S. JAMIESON
via the Internet

There is an easy way around, in fact. As always, use the Network applet in **Control Panel** to change the IP numbers and domain addresses, but when Windows tells you to restart, don't listen to it. Click the **Cancel** button, then dial in to your ISP or company network, whichever you've configured the Network app to allow. You can keep doing this over and over, but remember that when you do restart Windows, it will load with the last network settings you specified before you shut down.—NR

whether the system is connected to the Internet when you want to log on, or even whether the system is on. A quick (read: inexpensive) voice call to the office will be enough to get the system set for an incoming call and get you the information you need to make the connection.

Your strategy in this case would be to make the voice call, then ask your helper to set up the system as necessary—which might include turning it on and will include connecting to your ISP. Once connected, some programs will make finding the IP address simple. With pcAnywhere 9.0, for example, you'll find the IP address in the **Host Status** screen that also confirms the program is waiting for a call.

For programs that don't hand you the IP address, Microsoft Windows 95 and 98's Winipcfg does the job. Choose **Start | Run**, then enter the program name and choose **OK** (see Figure 1). (You could also run the DOS utility Ipconfig, which requires opening a DOS window, a longer wait, and then closing the lingering DOS window.) A still more elegant choice is to create a shortcut to run Winipcfg from the desktop, the **Start** menu, or the **Quick Start** toolbar.

However your helper gets the IP address, he or she can read the number to you, after which you hang up, establish a connection to the Internet on your side, and enter the host's address in the appropriate place in the program.

If your helper is too rushed to give you the information but your remote operations program offers a way to get the IP address automatically, then all the helper has to do is establish the host PC's Internet connection. With pcAnywhere, you can set the remote system to scan every IP address available through your ISP and return a list of pcAnywhere hosts waiting for connections. You can also get the IP address by running ICQ (a program and online service available at www.icq.com) on both host and remote systems.

IF NO ONE'S IN THE OFFICE

Even if you can't count on someone being in your office to help set up a session, your strategy for establishing a remote session is straightforward, as long as the program offers some way for you to get the host's IP address.

The only new twist in this situation is that you have to set up your system to do everything automatically: turn on, call your ISP, and load the host software so it's ready for you to log on from a remote location.

Turning the system on is easy with a remote power switch, such as the Server Technology's Remote Power On/Off-Aux ([www2.servertech](http://www2.servertech.com)

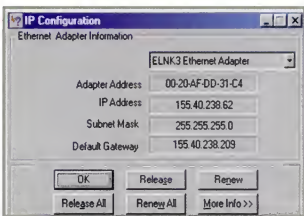


FIGURE 1: This standard Windows utility quickly displays your Internet-connected machine's IP address.

.com) or the Deltronix Remote Power Switch (www.deltronix.com). The Server Technology switch will turn your system on when you call and then turn it off after you hang up, waiting as little as 2 minutes or as long as an hour, based on your settings. The Deltronix switch lets you turn the system on and off manually by calling in and punching in a command from a touch-tone phone.

Setting your system to connect automatically to your ISP and to launch the host program on boot-up is also straightforward. Most remote-control programs have some way to be automatically launched in host mode so that the system is ready to take a call. In pcAnywhere, for example, you'll find a check box in the host properties to **Launch with Windows**. For other programs, you may have to add a shortcut to the program in your **StartUp** folder. Depending on your version of Windows, you may be able to drag the shortcut to the **Start** Menu, then to **Programs**, and then to **StartUp**. Alternatively, you can use Windows Explorer to copy the shortcut into **C:\WINDOWS\Start Menu\Programs\StartUp**.

Once you've set the program to start automatically, create a shortcut for the Dial-Up Networking entry for your ISP and add that to your **StartUp** folder, too. You'll also need a program like RtvReco (shareware available at www.rtvsoft.demon.co.uk/Default.htm) to automate the entire process of pressing the **Connect** button and issuing other necessary commands. You can also set RtvReco to make sure that Windows reconnects if the connection is lost.

The final result should be that when you call your system and turn the power on remotely, the system boots up, connects to the Internet, loads the host software, and waits for you to start the session. You can then use the feature your remote-control program offers to let you find the right IP address, log on, and do your work.

M. David Stone is a contributing editor of PC Magazine.

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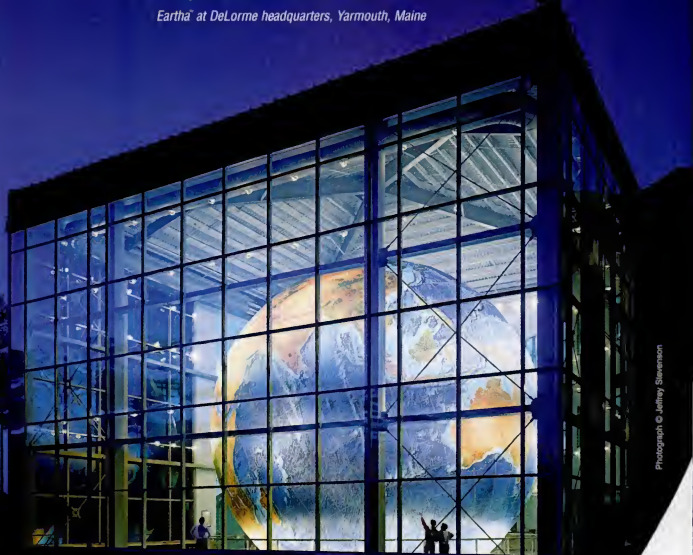
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Take Control of Explorer

Make Windows Explorer work *your* way. Command line switches are the key. **By Neil J. Rubenking**

Whether you're running Microsoft Windows 95, Windows 98, or Windows NT 4.0, you access the files and folders on your system using Windows Explorer. You launch it from the Start menu, or from a shortcut on the desktop, and it typically displays the contents of drive C:. Readers frequently ask how to make it start with a different drive, or start with no drives open. If you know the command line switches for Windows Explorer, you can make it start anywhere you want. You can use these switches in the command portion of a shortcut, at an MS-DOS prompt, or even in a batch file. This article will explain how the command line switches work and how some of them don't always work.

WINDOWS EXPLORER'S COMMAND LINE SWITCHES

Figure 1 shows the command line switches for Windows Explorer. They control the type of display Explorer will use, the initial folder and selection, and the scope of the Explorer window. Explorer can display the contents of a drive or folder in two different ways. If you right-click a folder and choose *Open*, you get a single-pane view (Figure 2). In this open view, each file or folder is represented by a large icon and a title. By default, Explorer "recycles" windows of this type. That is, if the desired folder is present in an existing open view window, Explorer will activate that window rather than opening a new one. If you right-click a folder and choose *Explore*, you get a two-pane view (Figure 3) called the *explore* view. Here, the folder tree appears in the left-hand pane, and the right-hand pane lists details about each file or folder, including the name, size, type, and last-modified date. If neither the */n* switch nor the */e* switch is present, Explorer uses the open

view and recycles existing windows. The */n* switch disables window recycling, forcing a new open view window. The */e* switch forces explore view; when using this view, Explorer does not recycle existing windows. If both switches are present, */e* is ignored.

The *subobject* and */select,subobject* switches control Explorer's initial display. When you add a folder name to the Explorer.exe command line to open that folder, you're using the *subobject* switch. If you precede the full pathname of a file or folder with

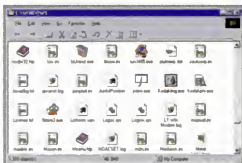


FIGURE 2: The open view shows files and folders as large icons in a single-pane display.

/select, Explorer launches with the specified file or folder highlighted and its parent opened. The command `explorer /e,/select,c:\windows\system` would open the c:\windows folder and highlight the system folder within it.

The */root,object* switch is powerful but used less often. The root folder is the one at the top of Explorer's folder tree—the one that has no parent (Desktop, by default). By using the */root* switch, you can specify any drive or folder as the root for Explorer's display. For example, you could create an Explorer window that displays only drive C:, with no direct access to virtual folders like Printers and Control Panel.

PUTTING THE SWITCHES TO WORK
Here's a quick trick to get you started. Open an MS-DOS prompt, navigate to any folder that interests you, and enter the command `explorer /e..` (That's *explorer, space, slash,*

Viewing Your USB Configuration

I enjoyed the article "Making USB Work" in your issue of February 23, 1999. I have just started to take advantage of Windows 98's USB capabilities, and I discovered a program buried on the Windows 98 CD that will tell you everything you wanted to know about your USB configuration and then some. It's found in `\tools\reskit\diagnose\usbview.exe`. I copied it to my Windows folder and created a link to it in my Start menu.

BRUCE PETERSON
via the Internet

You'll find the article at <http://cgi.zdnet.com/slink/716289>. As the article mentions, a variety of peripherals can be connected via the USB port—everything from digital cameras to mice, from scanners to fingerprint readers. *usbview* can be handy for diagnosing problems or for checking what devices Win 98 sees attached to the USB port.

To copy the *usbview.exe* file to your Windows folder, locate it in the right-hand pane of Windows Explorer, then scroll the left-hand pane so you can see the Windows folder. Right-drag the program onto the Windows folder, and choose *Copy here* from the pop-up menu. To add that link to your Start menu, drag the copy of the program in the Windows folder onto the Start button.—NJR

PrtSc Doesn't Print Screen

When I press the PrtSc key, nothing happens. Is there a way to get this to work on my Windows system the way it used to work under DOS?

JOHN SENEY
via the Internet

Under Windows, the PrtSc key captures your screen image, but instead of sending it to the printer as DOS did, Windows copies the image to the Clipboard. Note that you can capture just the active window by pressing Alt-PrtSc. Once the image is on the Clipboard, you can paste it into a graphics program—such as

FIGURE 1: USEFUL SWITCHES

Explorer [/n] [/e] [/root,object] [/select,subobject]	
<i>(neither /n nor /e)</i>	Launch Explorer in single-pane open view. If the new window would duplicate an Explorer window that's already open, simply activate the existing window.
<i>/n</i>	Launch Explorer in single-pane open view. Open a new window even if it duplicates an Explorer window that's already open. Overrides <i>/e</i> if both are present.
<i>/e</i>	Launch Explorer in two-pane explore view. Open a new window even if it duplicates an Explorer window that's already open.
<i>subobject</i>	Specify the drive or folder to be opened in Explorer.
<i>/select,subobject</i>	Specify the file or folder that will be initially selected. Its parent folder will be opened.
<i>/root,object</i>	Specify the root of the Explorer display. The user cannot navigate upward past the root. By default, Desktop is the root.

Windows Paint—and print from there.

If you want to make the process easier, a number of utilities available will do the job. For example, TechSmith Corp.'s Snagit (\$39.95 list, www.techsmith.com) can route the screen capture directly to your printer without showing a preview screen. (The utility does many other things as well.) There are many similar utilities available at ZDNet's Software Library (www.hotfiles.com), including a handy freeware program named PrintKey that can send your screen capture to a printer. —Alfred Poor

Return of the Multi-Column Programs Menu

In Windows 95, the *Programs* menu would expand to multiple columns if necessary, but this behavior disappeared in Windows 98. I found a way to re-enable this feature:

1. Start *Regedit* and go to `HKEY_LOCAL_MACHINE\Software\MICROSOFT\Windows\CurrentVersion\explorer\Advanced`
2. From the *Edit* menu, choose *New*, then *String Value*.
3. Type in *StartMenuScrollPrograms*
4. Double-click the new value and type *FALSE* as the data.

I think this tip requires that you have Internet Explorer 5 installed. Hope this is helpful to those who miss the Windows 95 behavior.

STEPHEN D. FORDICE
Mobile, Alabama

Judging from our letters, this Registry tweak should send many readers into paroxysms of bliss. It does require Internet Explorer 5, which is why we didn't discover it when the topic first arose.

Previously, we suggested grouping similar menu items into submenus, thereby shrinking the *Programs* menu and eliminating the need for scrolling. This is still good advice; even a multicolumn menu can grow too large for easy manageability. By following the instructions above, however, you can eliminate the scrolling *Programs* menu. —NJR

e, comma, period.) The single period represents the current folder, so you get a two-pane Explorer window showing that folder. The command prompt is the best place to experiment with Explorer's command line switches. When

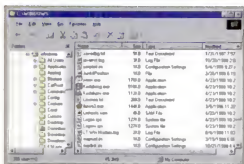


FIGURE 3: The explore view shows the folder tree on the left, file and folder details on the right.

you work out a combination you like, you can create a shortcut using that exact command, or you can insert it into an existing shortcut. Here are several switch combinations to try:

`Explorer /e,/select,c:\`

This opens a two-pane Explorer window with none of the drives expanded. This is handy if you have multiple drives and use them all frequently.

`Explorer /e,d:\`

This opens a two-pane Explorer window that initially displays the contents of drive D:.

`Explorer /e,/root,d:\data`

This switch combination opens a two-pane window that initially displays the contents of the data folder on drive D:, and from which the user cannot navigate anywhere other than in or below that folder.

`Explorer /e,/root,d:\d:\data`

This opens a two-pane window that initially displays the contents of the data folder on drive D:, and from which the user cannot navigate anywhere other than drive D:.

To create a new shortcut using a particular command line, right-click the desktop and choose *New | Shortcut* from the pop-up menu. Enter the full command line in the *Create Shortcut* dialog. If you have just tried the shortcut at an MS-DOS prompt, you can copy it from the prompt and paste it into the dialog. Click *Next* and give the shortcut a name such as *Explorer rooted on D*. Now click *Finish*; you'll find the new shortcut on your desktop. To move it to your *Start* menu, simply drag it onto the *Start* button. This puts the menu item in the main body of the *Start* menu, above the *Programs* menu. To move the item into the *Programs* menu, right-click the *Start* button and choose *Explore.Windows Explorer* will display the shortcuts and folders that define the *Start* menu; just drag the shortcut into the *Programs* folder or into one of its subfolders.

To change a desktop shortcut's command line,

right-click the shortcut and choose *Properties*. The *Target* field on the *Shortcut* tab of the resulting dialog is the command line you want (Figure 4). Enter your new command line. If the shortcut you want to change is in the *Start* menu, right-click on the *Start* button and choose *Explore* from the pop-up menu. Now navigate to the menu folder that holds the shortcut you want, and modify it as described here.

WHEN THEY DON'T WORK

In some configurations, the `/select`, `subobject` switch seems to fail. The subobject's parent folder is opened in the left pane and highlighted in the folder tree, but nothing is visibly highlighted in the list of files and folders. If you press *Tab* to move the focus to the detail list, however, you'll see that the subobject is indeed selected.

Microsoft's Knowledge Base notes several occasions where switches truly don't work. According to article Q20814, "Windows Explorer /N Switch Does Not Open a New Window" (<http://support.microsoft.com/support/kb/articles/Q208/1/14.asp>), the command `Explorer /n` fails to disable window recycling under Windows 98 and Windows 98 SE. Microsoft recommends using the `/e` switch instead. Article Q37494, "The Explorer Command Does

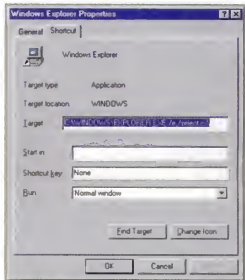


FIGURE 4: The *Target* field holds the command line executed by a shortcut.

Not Select the Correct File" (<http://support.microsoft.com/support/kb/articles/Q237/4/94.asp>), states that under Windows 98 SE, the `/select` switch without `/n` or `/e` may not select the correct file if the folder that contains it is already open. No workaround is offered. These glitches are minor, though, and don't affect all systems.

Neil J. Rubenking is contributing technical editor of PC Magazine.

What to Look For in Your New Computer's BIOS

Although often overlooked, the BIOS can determine your new PC's potential. **By Neil Randall**

As a knowledgeable user, you wouldn't dream of buying a computer without asking about such things as the type of processor, the size and speed of the hard disk, the amount of system and video RAM, and the availability of slots and drive bays. Often left out of the discussion, however, is the BIOS.

The BIOS comes along with the motherboard, but BIOSs are not all created equal. If you're trying to decide between two or three machines, the BIOS is definitely worth checking out. Asking a few questions about the BIOS will help you understand the potential for configuring your machine in the near term and upgrading it in the future.

Newer BIOSs will probably contain the features listed here. But many users buy new machines that aren't actually current; this happens especially with machines selling through Internet auction sites, where the system (even if in brand-new condition) might be last year's technology. Even with these, you should pay attention to the BIOS you're getting.

BOOTING OPTIONS

Most of the time, you'll boot from your main hard disk, the master drive of your primary IDE connection. But there are other options for boot locations: CD-ROM, floppy disk, removable drive, even a different hard disk (IDE or SCSI). Most computers ship with the BIOS set to check for an operating system (OS) in the floppy disk drive first, then on the main hard disk. Any modern BIOS also lets you move the floppy disk drive down the list so that the BIOS can check the main hard disk first, saving you a few seconds at boot time. Just remember to change this setting back if you want to boot from your Windows 95/98 emergency start-up disk, or your Windows NT, Linux, or BeOS installation disks.

There are times, though, when you'll want to boot from a CD-ROM. This is the case if your OS ships with a bootable CD-ROM. Set the BIOS boot

order so that the computer searches the CD-ROM before the hard disk, and the machine will boot. But BIOSs on older computers usually don't let you set a CD-ROM as the boot drive. Make sure the BIOS on your prospective PC does (most now do).

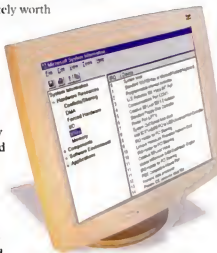
You should also find out whether the BIOS will let you boot from a hard disk other than your primary IDE drive. This feature lets you select which drive you want to act as your main drive without forcing you to open the case and change IDE cable connectors. The BIOS will search the hard disks in the order you list them, launching the first OS it finds. With this feature, you can easily have, say, three separate hard disks in your system, each with its own OS. You can also use the feature to install two separate instances of Windows 95 or 98—otherwise impossible without boot-management software. If you have (or plan to

have) SCSI on your system, see whether the BIOS will let you include a SCSI hard disk in the list of boot drives.

Note: This feature could result in an unwanted change in drive letters if you have multiple partitions on one or more hard disks. This may require you to reinstall programs or reconfigure the paths on which Windows should look for them. For example, let's assume you have a system with two hard disks (named Porgy and Bess), with two partitions on Porgy and three on Bess. Windows would name the drives differently in the case of either hard disk being listed in the BIOS as the first drive. Note that changing the boot drive will cause some or all partitions to change drive letters.

PRIMARY AND SECONDARY VIDEO CARDS

There may be a point at which you'll want to experiment with the multiple display support pro-



MAY I INTERRUPT? The System Information utility lists your interrupts and shows how they are being used.

Floppy Disk Surgery

A friend gave me some low-density floppy disks, and I heard that they can be changed into high-density disks. Is this true? And if so, how is it done?

TACI HUSIC
via the Internet

Low-density, 3.5-inch floppy disks have a total capacity of 720K, compared with the 1.44MB capacity of high-density floppies. Both are formatted with 80 tracks per side—and both are double-sided—but the difference comes from the fact that the high-density format uses 18 512-byte sectors per track and the low-density disks only use nine sectors per track.

There are some important physical differences as well. The most obvious is on the outside. Both formats have rectangular write-protect holes with plastic plugs that you can slide open to prevent the drive from writing or erasing data on the disk. High-density disks also have a second open hole on the other corner of the label edge; disk drives use this to sense whether or not the disk is a high-density disk.

Over the years, a number of companies have made gadgets that punch square holes in the correct location, causing floppy disk drives to treat low-density disks as high-density ones. These often work, but there are other differences in the disks. The high-density floppy disks need to store more bits per inch of surface area; as a result, they require a stronger magnetic field to record data. The media may be thinner than those of low-density disks as well.

It is not certain that punching a hole in a low-density floppy disk will result in a disk that really works as a high-density floppy. With new, preformatted floppies selling for 15 cents to 50 cents each, it may not be worth the effort to convert your older disks.—Alfred Poor

Fdisk and Hard Disks

I'm trying to install a SCSI card and disk, but I can't get Windows 98 to see the drive. Windows sees the card, the card sees the drive, and

during boot-up the disk is assigned as drive D:, but it doesn't show up in Windows. Am I missing a step?

DAN KIM
via the Internet

The step you didn't mention, which is likely to be the missing link, is that of running Fdisk to add a partition to the drive. Reboot in DOS mode and run the program from your \Windows\Command directory. Then choose item 5, *Change Current Fixed Disk Drive*, and make sure you pick the right disk to work with—presumably Disk 2—so you don't lose everything on your other disk. Then return to the main menu and choose item 1, *Create DOS Partition Or Logical DOS Drive*.

Follow the instructions on the screen, reboot, and Windows should see the drive. Use Windows to format the disk and it should work correctly.—M. David Stone

CD-R Media Compatibility

I have recorded some of my favorite songs onto a CD-R disk that plays fine on my home stereo but won't play on my new portable CD player. The player won't even recognize that the disk is in the drive. Is there some solution, short of buying a new portable player?

TONIA LENDERMAN
via the Internet

The fact is that there are different types of CD-R media, and these different types can have different reflectivity levels. The difficult part is that different drives will work better with some media types than others, but there's apparently no reliable way to predict which combinations are most likely to work.

The best approach is simply to get some CD-R blanks of different brands—trade with your friends to get a variety—and then see which ones work best on your portable player. Some sources report that either the "green-on-gold" or "gold-on-gold" media work better with audio CD players than do some of the other types.—AP

HARDWARE SOLUTIONS

vided by Windows 98, Windows 98 SE, and the upcoming Windows 2000. This feature lets you install a second video card in your system so that you can use two monitors simultaneously. The problem is that most users with two graphics cards have their main one in an AGP slot and want to put the second in a PCI slot. (Windows allows you to use two of each, and if you have two PCI cards there's no problem. But most machines ship with only one AGP slot.) When you combine an AGP card with a PCI card, Windows treats the PCI card as the main card by default, exactly the opposite of what most people want.

But this isn't really Windows' fault, it's the BIOS's. Some current BIOSs let you specify whether the AGP or the PCI video card should be treated as primary. Even if this doesn't seem important now, it could easily be so later.

Note: If your BIOS doesn't offer you this choice and you add a PCI video card to your existing AGP card, you will probably have to remove the AGP card and its drivers, install the PCI card, and then reinstall the AGP card to let the system work with multiple displays. In such a case, the PCI card will be the primary display.

DISABLING PORTS

PCs have come a long way since the old days, but they're still hobbled in far too many ways by the limited number of IRQ (interrupt request) settings available to them. The PCI interface has helped, mainly by allowing IRQs to be shared more easily, but it's still too common to have your PC full of cards and for one or more of them not to work with the others. For this reason, make sure your BIOS allows you to disable the ports you're not using. Each of them, after all, needs an IRQ to operate.

Most BIOSs have an area of their setup screens that lets you disable the serial and parallel ports. With the increasing popularity of cable and DSL Internet connections and hardware that uses the universal serial bus (USB), it's possible to get by in many cases with only one serial port, maybe even none. You might not even need a parallel port if you don't use a printer. If you plan to use a USB mouse, look for a BIOS that lets you disable the PS/2 mouse port (another IRQ), but keep in mind that not all operating systems recognize USB devices. Figure 1 shows a setup with some IRQs that could be freed up.

Of course, freeing up IRQs is no guarantee that devices will use them. Many device drivers insist on specific IRQs and can't be manually adjusted otherwise. Still, port disabling can be an important consideration.

CONFIGURING THE CPU

If you have one of the newer types of jumperless motherboards, there will be an area in your BIOS setup that offers low-level configuration settings that on most motherboards would require you to set jumpers on the board. Instead of finding the correct jumper and changing its settings (an nearly impossible task without removing the motherboard from the computer), you simply change settings via the keyboard.

Given that this BIOS feature is about fiddling with your CPU's speed and voltage settings, look into it only if you know why you'd bother changing these things in the first place. It will help you experiment with processor overlocking (forcing your CPU to run at a faster speed than the manufacturer establishes), but you run the risk of rendering your system unstable. You can change the voltage, but in doing so you could fry your CPU. But if you need these features for any reason, ask to see whether the computer you're considering has them.

CRIB SHEET BIOS CHECKLIST

When you're shopping for a new PC, be sure to find out whether its BIOS has the capabilities below. If it doesn't, the machine is probably using last year's technology. Note that this is not an exhaustive list of features, but if your prospective PC's BIOS has these, you'll get the advantages of an up-to-date BIOS that should let you do the following:

- change the order of drives from which the PC looks to boot;
- boot from a CD-ROM;
- boot from a hard disk other than the primary IDE drive;
- specify whether the AGP or the PCI video card should be treated as primary;
- enable and disable USB ports;
- disable the serial and parallel ports;
- disable the PS/2 mouse port;
- reduce the number of tests the BIOS performs during the boot process;
- password-protect the system.

BIOS BONUSES

There are plenty of other BIOS features worth inquiring about, such as reducing the number of tests the BIOS performs during the boot process (in order to shorten boot time), and password-protecting your system at the BIOS level, but these have been pretty well universally available in BIOSs for the past couple of years.

The features discussed above are more recent, so we singled them out for special mention. The point is that you want the most flexibility you can get with your system, and getting stuck with an options-challenged BIOS can significantly reduce your system's overall configurability and usefulness.

Neil Randall is a contributing editor of PC Magazine.

Internet Services in Windows 2000

The latest version of IIS brings greater power, flexibility, and ease of use to administrators and developers. **By Keith Pleas**

The latest version of Microsoft Internet Information Service is now shipping with Windows 2000 Server. As you would expect with a product in its fifth version, the changes are clearly evolutionary or additive. Still, IIS 5.0 offers new features and options that ease administration and Web development. Sites upgrading from the previous version should experience little or no difficulty.

IIS 5.0 uses the administrative interface introduced with the previous version: a Microsoft Management Console (MMC) snap-in showing all the services and sites in a tree view. You view and configure all options using an enhanced *Properties* dialog. Context menus for sites ex-

when individual services fail. Also, by default, IIS runs all applications in a common or pooled process that is separate from core IIS processes.

Logging has also been extended: In addition to a new option to create hourly logs—important for high-volume Web sites—IIS can also be configured to log Process Accounting data, including such measurements as User and Kernel time, page faults, and terminated processes. This lets administrators determine which sites are using too many resources or which might be malfunctioning; administrators can then institute process throttling to limit the percentage of CPU time allowed to individual Web sites for out-of-process applications.

HTTP support has also been enhanced. In addition to customizable error messages, IIS 5.0 includes support for HTTP Compression, which compresses both static and dynamic Web pages for faster transmission to compatible browsers. Dynamic pages must be individually compressed, but compressed static Web pages are retained in a configurable cache to provide extra performance gains for subsequent requests. IIS 5.0 also provides the server-side support for Microsoft's new Web Distributed Authoring and Versioning (WebDAV), an extension to HTTP 1.1 that enables remote authors to manage (create, move, or delete) files and directories on a server over an HTTP connection.

SECURITY

IIS 5.0 also includes a few new security features. The product has always supported several authentication mechanisms: Anonymous, Basic, NT LAN Manager, and Windows NT challenge/response. The new Digest authentication method transmits password hash values rather than the passwords themselves. Digest authentication is a substantial improvement over Basic authentication—which passes the password unencrypted—because it is generally not feasible to decrypt hash values.

Windows NT challenge/response is now called *integrated Windows authentication* and has been enhanced to support the Kerberos v5 authentication protocol implemented in Windows 2000. Kerberos offers several advantages, perhaps the most important of which is the ability to pass authentication credentials to other computers that also support Kerberos—

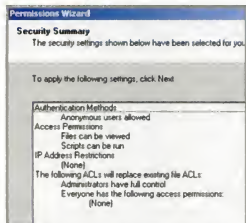


FIGURE 1: The new Permissions Wizard simplifies the process of assigning file permissions.

pose several new options, including a security Permissions Wizard (Figure 1) and the ability to install, remove, and verify server extensions. The Permissions Wizard helps you configure Web site access more easily by assigning access policies—including authentication methods, access permissions, IP address restrictions, and special access control lists (ACLs)—to virtual directories and files.

Under the hood, IIS 5.0 takes advantage of the new Windows 2000 recovery options for services. When a service fails, you can now set Windows 2000 to 1) restart the service, 2) run a file, or 3) reboot the computer for the first, second, and any subsequent failures. Together with the failure counter, this capability allows IIS run scripts that—for instance—page administrators

Detecting the Windows Desktop Update

The Windows Desktop Update is installed as part of Windows 98, and optionally with Internet Explorer 4 (but not Internet Explorer 5). How can you be sure the WDU is present on a particular system? Here are two simple tests you can try:

- Right-click the taskbar. If the pop-up menu includes a *Toolbars* item, the WDU is present.
- Right-click an item in the *Programs* menu. If a pop-up menu appears, the WDU is present.

Other tests are appropriate if you're writing scripts or programs that rely on features of the WDU. Examine the Registry value `IsInstalled` in the key `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Active Setup\Installed Components\{09022200-ECB0-11cf-8885-00AA005B4395}`. If this value's data is 1, the WDU is installed.

Another approach, one that avoids the Registry, is to call the `FindWindow()` API function and search for a window of class `BaseBar`. This is the window class for the enhanced *Start* menu installed by the WDU. If you find a window of this class, the WDU is present. —Neil J. Rubenking.

When Is a Full Disk Not Full?

I wanted to determine the fixed number of entries the root directory of a RAM disk holds, so I filled each of my three RAM disks. I got different results each time. What gives?

HARLEY FLANDERS
Jacksonville Beach, Florida

The number of directory entries in the root directory is indeed fixed, but the number of entries for each file can vary. An old-fashioned "short filename" uses one entry, but if even one letter of the name is lowercase, it will require two entries. Longer filenames require still more entries.

A standard 1.44MB floppy disk's root directory can hold 224 filenames of the form `TEST0001.TMP` but only 112 filenames of the form `Test0001.TMP` and only 74

names in the TestTest###.TMP format.

There's a simple solution to this problem. Instead of copying files to the root directory of a floppy or RAM disk, create a single subdirectory and copy the files into it. Subdirectories can expand as needed, limited only by the disk's capacity.—NJR

Add a DWORD Registry Value from an INF File

How do you add a Registry value of type DWORD using an INF file in Windows 95? Also, is it possible to invoke a program from an INF file?

THO NGUYEN
Livonia, Michigan

Among their other capabilities, INF files can be used to add or remove Registry keys and values. Each line in the AddReg section adds a key, a key and a value, or a key, a value, and data. The flags argument before the actual data indicates the data type. A 0 in the lowest bit indicates a string value; a 1 means the data is of another type. Several other bits specify exactly what type; 0x10000 is the code for a DWORD value. For Win 95 compatibility, the flag must be expressed as a decimal number, and the data as four hexadecimal bytes.

This very simple INF file adds a DWORD value with the data 09C0FFEE. Save it as TEST.INF, right-click it in Explorer, and choose Install.

```
[Version]
Signature="Chicago"
[DefaultInstall]
AddReg=MyAddReg
[MyAddReg]
HKLM,ATest,"A
DWORD",65537,ee,ff,c0,00
```

You can only launch a program from an INF file indirectly, by placing the program in the RunOnce Registry key.—NJR

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PC TECH SOLUTIONS

including those running non-Windows operating systems. This ability to delegate authentication to another computer makes it easier to scale a Web site by using separate machines for Web servers and database servers. Previous solutions, such as keeping all services on one box, executing all client requests in the same security context, or hard-coding security credentials into script files, tended to weaken the security architecture.

IIS 5.0 also supports Server-Gated Cryptography (SGC) and Fortezza. SGC (RFC 2069), which requires a special certificate, allows financial institutions with export versions of IIS to use strong, 128-bit encryption. Fortezza—a registered trademark of the National Security Agency—is a U.S. government messaging security standard written to the Defense Message System security architecture (www.armadillo.huntsville.af.mil).

Windows 2000 includes Certificate Server

responding error-handling capability, so developers can trap errors in script files. ASP also supports new flow-control capabilities that allow the server to execute other pages without the overhead of round trips required by traditional server-side redirects.

Performance has been greatly improved for scriptless ASP pages. Many sites use the ASP file extension for all pages so they don't have to change links and indexes if they subsequently add script to what was previously an HTML-only page. Unfortunately, this shortcut incurred a penalty in previous versions of ASP, which loaded the default scripting engine even when there was no code. A new check in the parsing stage short-circuits this problem. ASP now detects when executing requests are blocked by (waiting on) external components and automatically creates additional threads to allow other requests to continue processing.

COMPONENTS

One of the most interesting new features is script encoding (also known as script obfuscation). IIS 5.0 includes the latest Microsoft scripting engines—VBScript 5.0 and Jscript 5.0—both of which support this feature. In script encoding, scripts that were previously stored as plain text are encoded through a simple transformation (similar to the *uencoding*) to render them indecipherable to casual users. Encoded scripts are then decoded at runtime by the script engine. While not a truly secure solution, this can prevent most casual users from examining scripts.

ASP also now supports Windows Script Components, which can be used to turn scripts into reusable Component Object Model (COM) components for use by ASP and other COM-compliant programs.

ASP comes with more than a dozen pre-built components for things like logging, using counters, and accessing data and files. All of the components are faster and more scalable, and the Browser Capabilities tool has been enhanced to support capabilities described in cookies sent by the browser. This provides additional flexibility in running server code based on features supported by the target client.

IIS 5.0 gets some immediate benefits—such as the new security and administrative features—just by being bundled with Windows 2000. But the entire product has been revamped to improve performance and implement new features that keep up with the latest Internet standards and provide a solid platform for Web-based applications. For more information, visit www.microsoft.com/windows2000/guide/server/features/web.asp.

Keith Peas is a frequent contributor to PC Magazine.

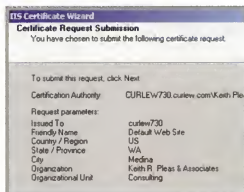


FIGURE 2: The Certificate Wizard helps you easily create certificates to enable secure SSL communications.

2.0, which provides substantially improved support for digital certificates over the rather rudimentary version introduced with the Windows NT Option Pack. Certificate support is also better integrated with IIS: A new Web Server Certificate Wizard (Figure 2) simplifies creating a certificate request to enable secure SSL communications. A second wizard helps administrators configure certificate trust lists (CTLs). A CTL is a signed list of root certification authorities (CAs) for a particular site. CTLs can be configured on a per-site basis, which is particularly useful for Internet service providers who must support multiple Web sites.

PROGRAMMABILITY

The application programmability of IIS 5.0 has also been enhanced. Both Active Server Pages (ASP), which is the primary mechanism for launching dynamic content under IIS, and the programmability objects themselves have improved performance as well as new features.

ASP provides a new *ASPF* object with cor-

Accept Cookies by Site

CookieCop lets you decide which Web sites are allowed to deposit cookies onto your hard disk. **By Mark Sweeney**

As you surf the Web, information about your identity or the actions you take while visiting a site is sometimes stored on your hard disk in the form of cookies. Web sites retrieve these cookies on your next visit to obtain information about you. Most sites use cookies for legitimate purposes, such as storing password or account information so that you don't have to reenter it, and some sites don't work unless your browser accepts cookies. But cookies offer the potential for abuse and can clutter up your hard disk, so most browsers let you choose whether or not to accept them.

The problem is that the setting that controls your acceptance or refusal of cookies is global: You can accept all cookies or no cookies, but not

some cookies. **CookieCop** lets you accept or reject cookies by site. Since it runs as a proxy server, it can be used with virtually any browser.

CookieCop runs under Microsoft Windows 95, Windows 98, and Windows NT 4.0. An article about how to use CookieCop and about the programming techniques used in its creation is available on our Web site at www.pcmag.com/utilities. A link to download the utility and its source code can also be found there.

Mark Sweeney is vice president of software at Clearview Software International, a company specializing in Windows-based client/server applications. Sheryl Canter is the editor of the *Utilities* column and a contributing editor of PC Magazine.

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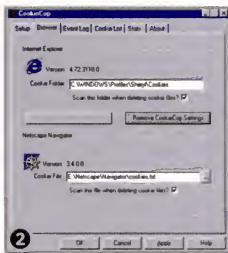
Via Mail: You can request utilities by fax at 978-772-7133 or write to PC Magazine Utilities, c/o Image Software Services, 67 Buena Vista St., Ayer, MA 01432-5030. There is a limit of six disks per month.

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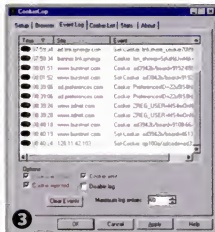


CookieCop runs as a proxy server, so it can be used with any proxy-capable browser. It is also compatible with other proxy servers such as firewalls. You can start CookieCop automatically when you run Windows or your browser.



If you're using Microsoft Internet Explorer or Netscape Navigator, CookieCop can delete unwanted cookies from your hard disk by scanning for any reference to a rejected Web site.

The Event Log lists all the cookies accepted, rejected, or sent as you browse the Web. This list, which can become amazingly long, gives you the information you need for configuring the Cookie List. The online tutorial explains how to interpret the information.



The Cookie List specifies the sites from which you want to accept or reject cookies. You can enter URLs manually or drag and drop the sites from your browser. You can also specify how to handle cookies that are not on the list.





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To all those who think the only real choice in NT-based e-mail servers is Microsoft Exchange, it's time to think again. Consider IMail Server 5.0 from Ipswitch. With its hassle-free, foolproof installation, you'll be up and running in just minutes. You won't need the specialized training required with Exchange. And you won't waste hours on administration - IMail Server is really simple to use. You can even add, modify and manage user accounts via the Web. Plus, IMail Server works with all popular mail clients, including Outlook, Netscape and Eudora, or any Web browser. As for price, IMail Server wins big time. Unlike Microsoft Exchange, IMail Server has no added costs as you add users. And a single IMail Server scales to thousands of users and over a million messages a day. In fact, as one small business owner says, "Ipswitch and IMail are about a light-year ahead of Microsoft and Exchange." Want more proof? Download a free evaluation from our Web site right now. And see how great the alternative can be - IMail Server from Ipswitch.

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Cookies Are Good, Bad, Good...

Few topics have caused as much confusion or spawned as many utility programs as cookies. The buzz about them has gone from ignorance to fear to relief to loathing to resigned acceptance. Now the pendulum is swinging back to loathing.

The issue, as ever, is activity tracking. People generally desire privacy and a degree of anonymity, especially when they're spending money or planning to spend money. When you stop to look in a store window, pay more attention to a commercial than to a television show, or flip through the ads in a magazine, nobody knows what you're thinking. Nobody takes down your name or makes a note of the last shop or ad that happened to catch your attention. Nothing matters until you actually buy something. And if you pay cash, even that transaction can be anonymous.

Anonymity is anathema to marketers. They want to maximize their advertising spending, trim their product selections, and even predict what you're going to do next. Not just you in the aggregate sense, but you in particular. We've talked in *PC Magazine* about how you can personalize the Web and tailor it to your specific needs. Marketers would like to go farther still and ensure that every ad you see is one that interests you. They'd love to know how much money you've spent on all of life's necessities and luxuries, what product brands you prefer, and what motivates you to buy.

A cookie is nothing more than a small text file that a site you visit writes, through your browser, to a specific subdirectory on your hard disk. Cookies help sites determine when you're a repeat visitor, and they're essential for navigation on some sites. They're footprints of all the places you've been on the Web. Normally, however, your browser will return a cookie only to a server in the domain that created it. This feature is designed to prevent sites from snooping to see where else you've been. So there's no problem, right?

Unfortunately, that's not the case with many banner ads. Banners are often served by central sites, such as DoubleClick.com. The larger the site you visit, the more likely it is to be served by a banner agency. But even small sites that use banner rotation programs and link sharing often have centralized banner servers. So the banner server may appear across dozens—even hundreds—of sites that you visit. Cookies that are set by the ad server can be read by any server in the ad company's domain,

no matter what URL the browser is displaying or what site you see on the screen. A given cookie probably contains the context in which the ad was viewed, making your activities across sites served by a given banner agency an open book.

Beyond cookies, a site could even collect your IP address each time you log on or make other efforts to figure out who you are. If you don't have a fixed IP address, you may think that all of this is immaterial, but getting an external connection to cause your machine to cough up a surprising amount of information about itself—and, for that matter, you—is not so difficult. For an eye-opening point of reference, check out www.pc-help.org/trace for a straightforward if huge batch file that can winnow out even your Ethernet adapter's MAC address and manufacturer code, along with your name.

If you want a higher level of anonymity for yourself, you can block cookies, using utilities or simply turning them off in your browser. Unfortunately, some sites go nuts, asking 20 or 30 times before a page is fully displayed. They may be trying to write only one cookie, but they may try repeatedly. You might not be able to use some sites at all without cookies.

You can also use cookie managers to obliterate cookies after your browsing session is over, but your activities during that session may well have been fed back to a central ad management site. Some ad sites, such as AdKnowledge and MatchLogic, have tens of millions of "personalized anonymous profiles" in their vast databases. These databases don't necessarily know you by name, but they know what you do online and when and where you're browsing. This is only a short, tempting step away from the line that RealAudio recently crossed by having RealJukebox send your musical activities to a central database "to serve you better."

Marketers wave the efficiency flag, but I prefer a Web with a degree of chance to one that's slavishly yet cynically attuned to my every whim. And I will not tolerate sites and products that tattle.

MORE ON THE WEB: Talk back to Bill Machrone in our *Opinions* section, and sign up for his new-products newsletter, www.pcmag.com/opinions.

When you look in a store window or flip through the ads in a magazine, nobody knows what you're thinking. On the Web, they do.

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Decade of Fear and Cowardice

The 1990s won't be remembered for much that is positive. Good riddance to that decade, which I look back on as a decade of fear and cowardice. That fear and cowardice were brought on in part by computer technology.

Fear and cowardice went hand in hand throughout the decade, beginning right off the bat in 1990, when big-gun engineer Dr. Gerald Bull was assassinated for supposedly trying to make a big gun for Iraq. His real goal was to shoot a satellite into orbit. The fear was that he'd design a gun that Iraq could use to shoot into Israel. Cowardly assassination was the easiest solution. After all, this was the decade of the drive-by shooting.

Then there was Bosnia, the Art Bell paranoia radio show, an impeached president, people hiding out in the hills, a slew of suicide cults, poison gas, and remote-control war. The Waco massacre comes to mind, as does the government sniper who shot kook Randy Weaver's son in the back and killed his wife, as she stood in a doorway holding a baby. How heroic. The sniper's reason: a failed court appearance. Then an office building full of women and children got blown up in Oklahoma City. This all happened in the 1990s, and fear and cowardice are the themes.

I see a serious gap between behavior and attitude, and our dissociated, computer-centric lifestyle could be what's allowing this to occur. The nineties were the decade of curious "wars." The Gulf War and the conflicts in the former Yugoslavia come to mind. Wars with no heroes, done by remote control, and guided by computers. The joystick wars.

Early in the decade I was talking with a venture-capital pal who was commenting on the on-again-off-again love affair with the set-top box. One company would suggest that the set-top box was the next big thing, and the next day everyone would announce one. "Today's business bases all its decisions on *fear*," he told me. Fear of someone getting a competitive edge. Fear of someone doing something you could do too. Andy Grove said you have to be paranoid to survive. But that's not true. Plenty of companies have done well without an insane fear of going broke or a siege mentality. Or hasn't anyone noticed?

Then there were the chicken-dung kids across the country who were being bullied or ignored or taunted and decided to take it out on their classmates by shooting them. This is the white, middle-class version of the drive-by shooting. An act of cowardice of the highest order. Most of these kids are computer geeks, although we like to downplay that. And yes, they have learned nonconfrontational

murder through computer simulations.

Then we have the end of the decade marked by the Microsoft trial. We have the nonheroic image of the world's richest man bent over and rocking in a chair, while pretending he doesn't know anything about memos he wrote. In fact, he needs simple words defined for him. Is he trying to mimic that Mafia don who pretended to be daft and walked around the street in PJs? I was waiting for Bill to roll up into a ball.

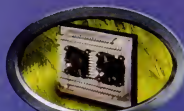
Into this charming atmosphere of squirrel-like behavior came the Y2K hype. Nobody had even known about Y2K until some Canadian showed that a lot of old COBOL programs wouldn't work. Suddenly, the BIOS wouldn't work, and Windows might not work. All hell broke loose, as billions and billions of dollars were spent to correct any possible problems. People actually decided that the power grid would fail and that they needed bathtubs full of water on December 31—"just in case."

Y2K became the thematic, fearful end of the decade and the biggest joke of the century, as the hype snowballed into fear of terrorism. One maniac gets caught coming across the border with explosives and the next thing you know everyone is on alert about the potential for massive terrorist attacks—all because of the year 2000. Seattle was so afraid that it shut down the Space Needle year 2000 fireworks celebration "just in case." There wasn't even an announced threat or prank phone call to trigger that decision. Incredible. San Francisco was hardly any better, as they boarded up the city in advance of New Year's Eve and canceled a fireworks gathering off the Golden Gate Bridge. The former was from fear of looters (none showed up), the latter from fear someone might object or be inconvenienced.

I say good riddance to the 1990s. They were disgraceful and embarrassing. Ferrari sales went up, and charitable giving went down. Dot-com millionaires talked loudly in public on cell phones, making idiots of themselves. Everyone acted creepy, and the music was crummy. What a terrible way to end a century or a millennium.

The 1990s were disgraceful and embarrassing. Everyone acted creepy, and the music was crummy.

MORE ON THE WEB: Read John C. Dvorak's news, views, and snide asides every Monday at PCMagazineOnline.com. And don't miss Dvorak's "Silicon Spin" every day on ZDTV. You can also view past shows at www.zdtv.com/siliconspin.



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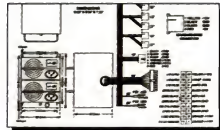
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Inside Track



What Are They Thinking? Dept. Remember the mini-era of the NC—network computer—causing a slew of panicky companies to announce the idiotic Net PC? This device was rolled out at Comdex to much fanfare, then abruptly dropped from production within months, and then forgotten. Intel was the company behind it, but every PC maker was on the bandwagon until the wheels fell off. Now Intel is swinging at yet another pitch. But this time it's a screwball, not a curveball. Intel is going to make a so-called **Web appliance**. This will be a low-end box **running Linux** and selling for \$300 that can do almost everything a Web surfer needs it to do. It will be DSL-ready. It will also be a Web phone of some sort and have a handset attached.

Now who is supposed to be the customer for something like this? The only people who **harp** on Web appliances are people who think they want to do a little Web surfing to get basic information. Do they want a Linux box with no oomph sitting around the house looking like a phone, or will WebTV suffice?

Meanwhile, WebTV users have been hit with a peculiar **virulike attack** that results in the user sending out profane e-mails across the Net without knowing about it. "Did this come from sweet Aunt Sally? Migosh, what's gotten into the woman?" I'm amused, at least.

While that hack's been going on, the **biggest stink** in the industry is **over the crack** of DVD encryption, which resulted in a program called DeCSS that got posted all over the world. The movie industry got completely **freaked** by this and managed to get various injunctions against sites distributing the code as well as against sites linking to sites that might distribute the code.

Meanwhile, you have to ask **who** besides a huge counterfeiter is going to use this code to make copies of DVDs? Coun-

terfeiters, wherever they are, already have either the master file or other ways of getting disks made. Let's face it: The average computer user doesn't have 4.7 gigabytes of hard disk space per movie to spare. **How many copies** of a movie can one person accumulate on a system with two or three large hard disks? Five, at the most? Or maybe the industry is afraid that people are going to copy onto writable DVDs. A blank disk that can hold half a movie costs \$20. You see the movies selling for \$14.95.

Where's the incentive?

Bootlegging, piracy, and even counterfeiting in the computer and consumer electronics worlds have always **stemmed** from a low-cost and convenient method of manufacturing. A blank CD or floppy disk plus the labor to copy a program costs no more than a dollar for computer software. Eventually, blank writable DVDs will be a dollar or two. Then people will dub DVDs. **This is one of those basic make-buy decisions** you learn about in business school. This problem would go away if the owners of intellectual property would simply drop prices.

Whither Amiga? Dept. It's the computer that never dies. One of the most advanced computers ever developed, the Amiga, is making a return—somehow. As you know, Commodore sold the company years ago to the Germans, who sold it to Gateway, who did nothing but sit on the thing. Now the brand name and OS has been sold to Amiga aficionado Bill McEwen. Gateway kept **47 patents**, either because the company thinks it can use them or because it wants to save face. The **real diamond in the deal** is the OS, which is a hot multitasking GUI OS that, in hindsight, was the **best OS on the market** for at least a decade. So what happens next? Development for the machine has long since dried up. It has potential as a controller for various NTSC video applications. The Video Toaster epitomized such use.

In fact, there is no reason why such a machine, if updated somehow, couldn't

Intel is going to make a so-called **Web appliance**. This will be a low-end box **running Linux** and selling for \$300.

provide a **reasonable alternative** to the PC and the Mac. To be very successful, though, you'd need a Steve Jobs-like hype-machine to revitalize the image. That not being likely, what can we expect from the new Amiga? Given its multitasking capabilities and NTSC compatibility, I'm thinking a **WebTV killer**. Possible? Why not?

It Never Ends Dept. Have you noticed how those Y2K experts sucking money from the Y2K test have **not weaned themselves** as promised now that the noncrisis is over? They tell us we have to wait six months to be sure—so they can be sure, actually, of a paycheck. **My favorite item** now pumped out by the media is that February 29 may now pose a hurdle for these poor computers. Gee, we're having a leap year, and things may go awry because of that. Has anyone in the media noted that **leap years are nothing new**? Sheesh. This is just pathetic.

If You See It, Buy It Dept. Look at the \$49.95 book in the Digital Masters series from New Riders Publishing called *Bert Monroy: Photorealistic Techniques*. For any computer graphics artist, this guy is the **king**, and this book outlines his techniques in great detail. Fascinating for anyone interested in computer art. You should note that Monroy was actually **banned** from certain art competitions, because his creations can look like scans of photos; they are that amazing. Recommended.

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Life After Y2K

Now that Y2K worries are pretty much past us—except for the lawyers, who will make much of this for some time to come—I want to suggest three items that will be, or at least *should be*, on the agenda of nearly every reader of *PC Magazine* during 2000.

Security is topic number one for anyone using, or moving to, a broadband Net connection during 2000. Broadband connections—by which I mean anything 400 Kbps and up, but not including such pseudobroadband services as ISDN—are truly wonderful. If you don't have one today, you will soon. In fact, I predict that by the end of this year, something like 50 percent of *PC Magazine* readers will have access to fast Net connections at home.

Few of us will be putting T1 lines into our homes, and satellite and wireless broadband connections won't get interesting for at least another year. Which means we're talking about getting either an ADSL (Asymmetric Digital Subscriber Line) link from a phone company or a cable modem link from your friendly local cable-TV service provider.

Both bring painful security problems that you can't just ignore.

When you get your fast connection, you're going to fall in love with its "always-on" nature. And therein lies the problem: By leaving your Net connection open, or "live," all the time, you're setting yourself up to get hacked. Which could mean losing some or all of the files on your hard disk, to say nothing of making them readable to the cracker.

One partial answer is just not using the always-on feature, logging off of your connection when you're not actively using it. But that has two problems: You're forfeiting one of the advantages of the connection, and you can still be hacked while you are using it.

You need a hardware or software firewall in order to keep intruders at bay. The best software product I know is the BlackICE Defender package (\$40 direct, www.networkice.com). And the best hardware answer—more expensive, a modest nuisance to set up, but with more robust protection—is one of the BeadleNet 2000 series of products (www.beadlenet.com). This solution will cost you \$350 to \$500 (direct), depending on the options you choose.

Whatever you choose, remember that in the broadband world, security isn't an option; it's a requirement.

Speed that counts comes next. We're used to thinking

there's always merit in upgrading your PC frequently, as Intel and AMD bring out ever faster processors.

Well, gamers will always want the latest and fastest CPU (and graphics subsystem), but for the rest of us, think a little before buying. *PC Magazine* Labs tests have shown that the new, faster CPUs do make a difference in the perceived quality of your Web experience. But the incremental gains beyond, say, 500-MHz Pentium IIIs come at a relatively high price. And your connection speed is always far more important in speeding up the Net.

Sure, I want one of those cool 1-GHz Intel CPUs we'll see later this year. But realistically, the 500-MHz Pentium III-based PC you buy today will give you a great Web experience for some time to come. Intel and AMD are eager to sell chips, so they create upgrade hysteria. But that doesn't mean you have to succumb.

Walkaround Net access is my third issue. I don't mean walking around with your notebook PC or other connected device in your office or home; there are plenty of wireless networking products that make that easy and worthwhile today. I mean the ability to pull your PC out pretty much anywhere and connect. Or find it already connected.

Near-term, Metricom's Ricochet service is probably your best bet. It is intensely local, so you can use it only in cities (and some airports and college campuses) especially set up with Ricochet. And it's only 128 Kbps, tops, so we're back in the relatively sleepy world of ISDN speeds. But the power of being able to work—to connect—anywhere and anytime is great, and even at 128 Kbps it's worth the trouble.

Metricom (www.metricom.com) is expanding the Ricochet service to more cities this year, for a total of about 20 cities up and running by the end of 2000. With flat-rate pricing of \$29.95 per month, Ricochet is a good if interim answer.

Longer-term, we'll see the Ricochet service supplanted by faster wireless solutions. But that's next year or the year after. Don't pay the steep opportunity cost of waiting: If Ricochet is available in your area today, call 'em up.

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Remember that in the broadband world, security is not an option; it's a requirement.

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Drive Price	\$299	\$299	\$349	\$329	\$169
Media Price	\$1.30/GB	\$3.21/GB	\$31.00/GB	\$11.54/GB	\$40.00/GB
Native Transfer Rate	1MB/s	0.75MB/s	8.7MB/s	0.6MB/s	2.4MB/s
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Wireless Strategies Wise Up

It's an appropriate analogy: information flowing through a pipeline or traveling along a (forgive me, please) *information highway*. If you need information delivered fast and in bulk, you need a tangible physical connection running from where the information is to where you are. But it's oh, so delicious when you can cut the cord. A little information anywhere at any time beats a flood of information available only when you're in close proximity to a hard-wired connection. Here's my take on three go-anywhere Internet and e-mail connection strategies that use wireless rather than wired transmission.

Two-way pager e-mail. This uses pagers with tiny, thumb-typeable QWERTY keyboards that let you create or reply to e-mail messages wirelessly. The best-known are the Research in Motion (RIM) BlackBerry and the Motorola PageWriter 2000. You'll pay roughly \$350 for the pager and \$50 a month for service. There've been a couple of popular press stories about how two-way pagers are replacing traditional e-mail-fetching laptop computers. That's nonsense. E-mail pagers can be good for sending short, time-critical messages, but they can't handle the flood of long-winded mail most people get. Add-on services let you get news and stock prices. You can of course also get traditional pager messages. **The verdict:** Two-way pagers are a great addition to your existing e-mail system once senders learn to keep their messages concise. The BlackBerry is more compact; the PageWriter has a better keyboard.

Wireless PDAs with Web browsing and e-mail. Mostly this means the 3Com Palm VII, but you can also attach wireless modules to other Palms and to Windows CE devices, but the Palm VII is simply more elegant. You can browse Web sites in real time, as long as you don't expect a lot of information in a hurry. The Palm VII uses an intermediary service, called Web clipping, which repackages graphical information into mostly text. Receiving e-mail is no problem; sending messages is, unless you've mastered Graffiti, the Palm's handwriting recognition software. But do check out the \$100 folding QWERTY keyboards that clip to the base of your Palm, available from Targus and others. They're neat and about the same size as the PDA itself. **The verdict:** PDAs are better than two-way pagers for Web surfing and are great for users who've already built their lives around Palm Pilots or similar PDAs.

Next-generation cell phones with Web browsing and e-mail. Despite the advertising hype, these have yet to get off the ground in the U.S., although the phones are trickling into the marketplace. What you get is a cell phone with a

bigger-than-usual display that can receive and send messages and browse the Web. The problem is packaging: You want a cell phone to be small, and you want the display (and keyboard) to be big, so most of these devices are going to feel like the compromises they are. Also, the best cellular technologies for smart phones are CDMA and GSM, neither of which has yet caught up to the dominant TDMA technology. Sony president Nobuyuki Idei warned that while the U.S. leads the world in so many things, cellular messaging isn't one of them. He's right. **The verdict:** Great potential, but watch out for the gotchas over the next year.

Some other thoughts about wireless e-mail and Web browsing. The advantage goes to the young and those who've arrived at middle age with their eyesight intact; the screens are for the most part small and dim. Paging reaches farther into buildings than other wireless services, and most messages are received within 10 seconds of being sent; the other technologies can't match that. Bluetooth, the short-distance RF technology that will go into a lot of cell phones a year from now, could be the data transceiver standard for PDAs or notebook PCs with far bigger screens (or better keyboards) than the cell phones have, but the cell phone's tiny display would still work if you didn't have any other device available. In almost every case, your wireless e-mail will be a separate e-mail address; you can set up rules to forward e-mail from another account, but the best bet is to have a smart administrator or coworker whom you trust read your e-mail and send you short summaries. The problem with forwarding messages marked "urgent" is that they're urgent to the senders, not necessarily to you. Two-way wireless messaging doesn't have to be just for high-paid white-collar workers: It's great for a salesperson wandering a 10-acre used-car lot with you trying to find the model and color that comes close to what you want. If you've got a digital cell phone, you may have one-way alphanumeric messaging already. Your address is often your area code and phone number followed by the service name; for example, with AT&T's One Rate service, the address would be 1231231234@mobile.att.net.

E-mail pagers can be good for sending short, time-critical messages, but they can't handle the flood of long-winded mail most people get.

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BY NANCY SIRAPYAN



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market, the Web can be a great source for company data. It can also provide a great deal of misleading information. Here are some of our favorite sites to help you find the information you need without having to wade through some of the more dubious offerings that are out there.

GET THE FUNDAMENTALS

Begin by getting a bird's-eye view of the company. **Hoovers Online** (www.hoovers.com) provides information on about 14,000 public and private companies worldwide. Though in-depth data is available only to subscribers, the free offerings are impressive. These include a brief profile, a list of key executives, basic financial and ownership information, and much more.

If you're primarily interested in foreign companies, the venerable **Kompass International** (www.kompass.com), publisher of numerous directories that cover 1.5 million companies in nearly 70 countries, has made its entire worldwide company database available on the Web.

An excellent resource for high-tech companies is the **CorpTech Database of Technology Companies** (www.corptech.com) which covers 50,000 public and private technology manufacturers and developers. It offers basic directory and ownership information and a brief description of each technology company. If

you're looking specifically for computer and Internet-industry companies, try the **ZDNet Company Finder** (www.companyfinder.com).

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CATCH THE LATEST NEWS

Specialized news search engines can be an easy way to get a quick glimpse of how the media is covering your company. One of our favorites is **Excite News** (<http://news.excite.com>). It crawls over 300 news sites, including newswires, major news sources, local newspaper sites, and Web periodicals. We particularly liked the option to group results by date or publication. **Newsindex** (www.newsindex.com) covers current (though not archived) stories from over 300 news sites. It not only indexes major players such as CNN but also has exceptional coverage of English-language local newspaper sites from around the world.

If you're just interested in major news sources, try **HotBot News Channel** (<http://news.hotbot.com>). This searchable, 30-day archive is updated hourly and indexes a variety of major Internet news sources, including CBS MarketWatch, The Financial Times, the San Jose Mercury News, Time Daily, USA Today, and ZDNet News. A good free site for wire service stories is Northern Light's **Current News Search**

(www.northernlight.com/news.html). This searchable, two-week archive covers about 50 newswires from around the world, including Business Wire, PR Newswire, and Asia Pulse.

GO BEYOND THE BASICS

Once you've covered the fundamentals, you can try checking some less obvious resources. For example, U.S. federal government Web sites can be a rich source of information. The **Department of Justice Antitrust Division** (www.usdoj.gov/atr) lets you browse or search the full texts of selected antitrust case filings, appellate briefs, congressional testimonies, press releases, and other documents produced by the agency since December 1994.

For information on a company's intellectual property holdings, try the **U.S. Patent and Trademark Office's** (www.uspto.gov) searchable full-text databases of pending and registered U.S. patents and trademarks. Another impressive resource for patents is the **IBM Intellectual Property Network** (www.patents.ibm.com), which covers the U.S., Japan, Europe, and the World Intellectual Property Organization.

SiliconValley.com's Venture Capital Survey (<http://www.vdwdyn.mercurycenter.com/business/moneytree>) is a searchable database of U.S. firms that have received venture capital funding over the past year. Want to know what domains the company has registered? Try **DomainSurfer** (www.domainsurfer.com), **checkdomain.com** (www.checkdomain.com), or the **dot com directory** (www.dotcomdirectory.com).

UnityMail Express
www.messagemedia.com

HOT LINKS

Building a list? You're not alone. Check out the resources, forums, and newsletters about newsletters at List-Universe.com and its associated site, Sparky's List Tips. If you want to take the management of your list into your own hands, try one of the do-it-yourself applications available. To outsource your newsletter entirely, companies such as CompanyNewsletters.com will provide turnkey service. List-Universe.com
www.list-universe.com
Sparky's List Tips
http://list-tips.com

Mustang ListCaster
www.mustang.com
NTList
www.gordano.com
Seattle Lab List Server
www.seattlelab.com
SmartList
www.promail.org
SVList
www.svlist.com
■ DO MORE OF IT YOURSELF
CompanyNewsletters.com
www.companynewsletters.com
■ OPT-IN MAILING-LIST PROVIDERS
BulletMail
www.bulletmail.com
Electronic Direct Marketing
www.edmarketing.com
InfoBeat
www.infobeat.com



MAILING LIST MANAGER

Welcome to PostMaster General
Email mailing list management and delivery service

Featuring over... **NEW!**
1,000,000
recipients per list

WHAT IS POSTMASTER GENERAL?

PostMaster General is an email mailing list manager, which automatically handles email mailing lists for your organization. PostMaster General can be integrated directly into your web site, providing a customized mailing list subscription and delivery, and allowing your web site visitors to search and view previously sent messages with our unique message archive interface.



Mailing List Manners 101
http://db.tidbits.com/
getbits.cgi?bart=05386
■ DO IT YOURSELF
ListProc
www.cren.net
Listserv
www.lsoft.com
Lyris Email List Server
www.lyris.com
MajorDomo
www.greatcircle.com/
major-domo

PostMasterDirect.com
www.postmasterdirect.com
■ E-MAIL CAMPAIGN PROVIDERS
eGain Communications
www.egain.com
Exactis.com
www.exactis.com
Kana Communications
www.kana.com

Network-Attached
Storage
(page 148)

PRODUCTS REVIEWED
HP SureStore HD Server 4000
www.hp.com/storage
Intel InBusiness Storage
Station
www.intel.com/network
Linksys Instant GigaDrive
www.linksys.com
Maxtor MaxAttach 72
www.maxtor.com/maxattach
NetGear Network Disk Drive
ND520
www.netgearinc.com
N55 µStor IU
www.n55solutions.com
Procom NetForce 100
www.procom.com
Quantum Snap Server
www.snapserver.com
SciNet Blazer
www.scinetcorp.com
HOT LINKS

The following sites provide in-depth information on the storage industry and specifically on network-attached storage. Visit them to find white papers, glossaries, articles, and lots of useful links.
Disk/Trend
www.disktrend.com
The NASD Project
www.nasid.org/nasd
Storage Networking Industry Association (SNIA)
www.snia.org

Tax-Preparation
Software
(page 190)

PRODUCTS REVIEWED
Kiplinger TaxCut Deluxe
Multimedia
www.taxcut.com



Microsoft TaxSaver Federal
Deluxe

www.microsoft.com
Quicken TurboTax
www.turbotax.com
TaxACT '99 Deluxe
www.taxact.com

HOT LINKS

Go to these sites for additional information on the tax-preparation software we review in this issue and to find out more about tax preparation and filing online.
TaxCut Online
www.hrblock.com and
http://moneycentral.com
Web TurboTax
www.webturbotax.com

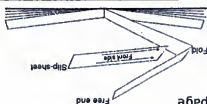
ction

QuickCart

Name Brands
SmartCodes
Order status
Same day shipping
Custom configuration
24 x 7 technical support
Factory trained technicians
Fortune 1000 company
by-side comparisons
use search engine
able advice
ions



Computing Solutions
Built for Business™
www.cdw.com
800-229-4239



1. Open the foldout page
2. Insert this sheet with
1. Front side touching the free page
2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet



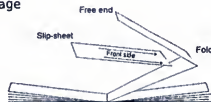
GbsSlipSheet-001



Foldout slip-sheet

Folded edge of the page

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side

Related Links continued

EchoStar DishPlayer 500 with Microsoft WebTV Personal TV service

www.dishnetwork.com

www.gateway.com

www.hercules.com

www.hercules.com

www.hp.com

www.hp.com

www.ibm.com

www.ibm.com

www.netobjects.com

www.netobjects.com

www.networkinspector.com

www.fluke.com

www.norton.com

www.symantec.com

www.samsung.com

www.samsung.com

www.siemens.com

www.siemens.com

www.sys.com

www.tek.com

www.tek.com

www.visio.com

www.visio.com

www.wizcom.com

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www.wizcom.com



Circuit City

www.circuitcity.com

Club Photo

www.photoclub.com

Collab.Net

www.collab.net

eBay

www.ebay.de

eLance

www.elance.com

Excite@Home

www.excite@home.com

Guru.com

www.guru.com

HelloBrain.com

www.hellobrain.com

Juno

www.juno.com

Kmart

www.kmart.com

Microsoft

www.microsoft.com

Monster.com

www.monster.com

NetZero

www.netzero.com

Niku

www.niku.com

Nortel Networks

www.nortel.com

Opus360

www.opus360.com

Photo Access

www.photoaccess.com

Photo Loft

www.photoloft.com

RH Consulting

www.rhconsulting.com

Saga

www.saga.com

Shutterfly.com

www.shutterfly.com

Sony

www.sony.com

Virage

www.virage.com

Wal-Mart

www.wal-mart.com

Photo Access

www.photoaccess.com

Photo Loft

www.photoloft.com

RH Consulting

www.rhconsulting.com

Saga

www.saga.com

Shutterfly.com

www.shutterfly.com

Sony

www.sony.com

Virage

www.virage.com

Wal-Mart

www.wal-mart.com

WorkExchange.com

www.workexchange.com

Yahoo

www.yahoo.com

Zing

www.zing.com

Windows 2000

(page 116)

PRODUCTS REVIEWED

SEATTLELAB.COM

www.seattlelab.com

WorkExchange.com

www.workexchange.com

Yahoo

www.yahoo.com

Zing

www.zing.com

Windows 2000 Professional

Windows 2000 Server

Windows 2000 Advanced

Server

microsoft.com/windows2000

NOT LINKS

The following sites provide

information and support for

Windows 2000:

Dynamic DNS

[www.dns.net/dnsrd/](http://www.dns.net/dnsrd/docs/id.html)

Migration support services

[www.compaq.com/partners/](http://www.compaq.com/partners/microsoft/windows2000/index.html)

[microsoft.com/windows2000/](http://microsoft.com/windows2000/index.html)

index.html

Software for migration

www.entevo.com

FastlaneTech.com

www.fastlanetech.com

MissionCritical.com

www.missioncritical.com

Windows hardware

compatibility

www.microsoft.com/hcl

Windows 2000 hardware and

software compatibility

[www.microsoft.com/windows/](http://www.microsoft.com/windows/professional/deploy/compatible/default.asp)

[professional/deploy/compatible/](http://professional/deploy/compatible/default.asp)

default.asp

Windows 2000 training and

certification

[www.microsoft.com/train_cert/](http://www.microsoft.com/train_cert/courses/1555afinal.htm)

courses/1555afinal.htm

E-Mail Publishing:

Getting the Word Out

(page 135)

SERVICES REVIEWED

eGroups.com

www.egroups.com

EnvoyMail

www.lstnettech.com

ListPlex

www.lsoft.com

Microsoft bCentral's ListBot

www.listbot.com

PostMaster General

<http://www.postmastergeneral.com>

SparkList

http://sparklist.com

Topica

www.topica.com

**We make it
easy for
you to
get it.**



**Select
Side
Easy to
Knowledge
Online solu
Smart Search**

AND LINKS

MORE ON THE WEB

Pick the Right Product

Our new online custom scorecards let you identify the criteria that matter most to you and adjust their relative importance until you find the product that meets your needs. Try it out for the e-mail newsletter services reviewed in this issue.

Get Our Free Newsletter

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Our software experts scour the Web to bring you a cool download every day. Start collecting them.

Plus:

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- Find tips and tricks at www.pcmag.com/solutions
- Check current PC prices at www.zdnet.com/shopping



Make your voice heard. Talk back to John C. Dvorak, Bill Howard, Jake Kirchner, Bill Machrone, Michael J. Miller, and Jim Seymour. www.pcmag.com/opinions

Read John C. Dvorak's News, Views, and Snide Asides every Monday. And don't miss Dvorak's "Silicon Spin" every day on ZDTV. View past shows at www.siliconspin.com.

Related Links

www.pcmag.com/hotlinks

Visit our home page for additional stories and links.

First Looks

(page 32)

PRODUCTS REVIEWED

Compaq Prosignia 170

www.compaq.com

Compaq Presario 1800-XL

www.compaq.com

Creative Labs 3D Blaster

Annihilator Pro

www.creative.com

Dell Inspiron 7500

www.dell.com

Dell Latitude CPx

www.dell.com

DPWeb

www.digitalpaths.net

TURN FOR ADDITIONAL RELATED LINKS ►

PC MAGAZINE AND BEYOND



www.pcmag.com

New-product reviews, benchmark test results, and computing trends fresh every day, along with opinions, discussions, and free utility downloads.

www.zdtv.com

TV about computing, all day, every day. Want to get it? Call your cable operator.

www.zdnet.com

News, reviews, downloads, shopping, auctions, and more at the world's largest computing site.

www.zdevents.com

Make plans to attend industry trade shows around the world.

www.smartplanet.com

Register now for any of hundreds of online classes on all aspects of computing.



You know
what you
want.



www.cdw.com

**CDW.com. Not just another
place to buy computers.
It's CDW at a different address.**



Anyone can set up a virtual site and sell computers. But with CDW.com, you have the comfort of knowing there's a FORTUNE® 1000 Company behind the Web address. At CDW.com, you'll be working with your own account manager, backed by a whole team of computer experts. And when you e-mail us, our system automatically puts your company's name into the subject header and flags your message as top priority. Which means you save a lot of time. At CDW, we've built the most efficient direct business model in the industry. One designed to save you money and be responsive to your needs. Bottom line, it's what's made us the industry's leading Direct Solutions Provider. So check out the award-winning CDW.com today. We're proud to stand behind it. Literally.



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WINDOWS

WAS IT WORTH THE WAIT?

In a word, yes—it was worth the wait. PC Magazine Labs has been testing Microsoft Windows 2000 for over a year, and we're very impressed with the scope and power of its new features. We're even more impressed with its stability; crashes have been exceedingly rare.

Specifically, the bigger your business or the more you're already using Windows NT, the more value there is in making the upgrade. If you're a small office, multimedia company, or game user, we advise waiting for the rest of the industry to catch up before embracing Windows 2000. We found upgrading existing Windows 98 systems to Windows 2000 Professional very tricky because of numerous hardware and software compatibility problems. Upgrading Windows NT desktops and notebooks was easier—but not without problems. For medium-size and large organizations, Windows 2000 provides valuable tools for building and expanding your e-business.

After years of claiming to have an enterprise-class directory service, Windows finally has, in Active Directory, one that can compete with the best of them. And Windows 2000 provides an impressive platform of Internet, intranet, extranet, and management applications that integrate tightly with Active Directory. You can set up virtual private networks—secure, encrypted connections across the Internet—with your choice of protocol. You can encrypt data on the network or on-disk. You can give users consistent access to the same files and objects



WHAT TO EXPECT IF YOU...

...WORK AT HOME

Home-office users will like Windows 2000 Professional's interface, which resembles that of Windows 98. Upgrading from Windows 98 can be difficult, however, and your hardware and software may not work. Consumer home users are better off waiting for the Windows Millennium Edition.

...ARE ON THE ROAD

Remote users will find an improved environment for notebook computing, including Plug and Play, power management, and file synchronization. You'll need at least 64MB of RAM and a 2GB hard disk, however, and Windows 98 users should watch out for hardware and software incompatibilities.



...RUN A SMALL BUSINESS

Small businesses will appreciate Windows 2000's reliable server and client OS, excellent security and backup, and flexibility for expansion. Many features require learning to use Active Directory, however, which may be daunting for this class of user.

2000

BY LARRY SELTZER

ILLUSTRATION BY JEFF FOHL

from any network-connected PC. You can use the Windows Installer to distribute software to users over the LAN.

Unfortunately for many organizations, upgrading network systems to use Active Directory will require months of planning. Moreover, there is no undo command: adopting Active Directory is a one-way street. What this means in practical terms is that many shops will be operating in what Microsoft refers to as Mixed Mode (with some Windows NT 4 domains) for a while—able to take advantage of many of Windows 2000 features but not all.

Fortunately for individual users, the workstation version of Windows 2000, called Windows 2000 Professional, is actually easier to use than Windows NT 4 and has much better support for newer peripherals and mobile users.

Windows 2000 Server comes in three editions: Server, Advanced Server, and Datacenter Server, the last of which won't ship until mid-2000. The more advanced and expensive versions have support for greater numbers of processors and larger amounts of memory and have better high-availability features, such as load balancing and clustering.

In the following pages, we tell you the good and the bad of what we found.

...RUN A LARGER NETWORK

Medium-size and large enterprises need Windows 2000's enterprise-class directory, desktop management, security, application services, and strong Internet/intranet integration. A full upgrade to Native Mode using Active Directory, however, could take months or years—and there's no turning back.

...PROVIDE INTERNET SERVICES

Service providers will be attracted to Windows 2000's high-availability features and support for up to four processors and 64GB of memory (Datacenter will support 16 processors and 64GB of RAM).



INSIDE:

WINDOWS 2000 PROFESSIONAL

(Client OS)

Page 118

THE VERDICT: Fast, stable, mobile; difficult upgrade.
OUR RATING: ●●●

ACTIVE DIRECTORY

Page 120

THE VERDICT: True enterprise directory; complex migration.
OUR RATING: ●●●

MANAGEMENT

Page 122

THE VERDICT: Excellent desktop management; could be better integrated.
OUR RATING: ●●●●

FILE AND PRINT

Page 122

THE VERDICT: Everything's there; Windows has caught up with NetWare.
OUR RATING: ●●●●●

APPLICATION SERVICES

Page 123

THE VERDICT: Reliable, scalable, highly available.
OUR RATING: ●●●●

INTERNET INFRASTRUCTURE

Page 124

THE VERDICT: Good extranet platform.
OUR RATING: ●●●●

SECURITY

Page 126

THE VERDICT: Much more secure than Windows NT 4.
OUR RATING: ●●●●

SETUP AND MIGRATION

Page 131

THE VERDICT: Easy setup, difficult migration.
OUR RATING: ●●●

PERFORMANCE

Page 132

THE VERDICT: Faster servers, desktop equivalent to Windows NT 4.
OUR RATING: ●●●●

OVERALL RATING

THE VERDICT: A great improvement.
●●●●

WHAT THE RATINGS MEAN

●●●●● - EXCELLENT
●●●● - VERY GOOD
●●● - AVERAGE
●● - FAIR
● - POOR

MORE ON THE WEB: Go to www.pcmag.com for additional upgrade testing information and walk-throughs of key Windows 2000 features.

Windows 2000 Professional

rating ●●●●●

Windows 2000 Professional, the desktop part of Windows 2000, is more stable, more secure, and easier to use than Windows NT 4 Workstation. It's not an obvious upgrade for every system, but medium-size and large enterprises should strongly consider Windows 2000 Professional for new systems. And unlike Windows NT 4, Windows 2000 Professional is a great notebook OS. For the average home or home-office user—

or the less savvy small-business user—Windows 2000 Professional is still a little too large and too complex compared with Windows 98.

Windows 2000's user interface closely resembles that of Windows 98, with a few new bells and whistles thrown in. For example, the new Personalized Menus feature tracks your use of the interface and hides options in the Programs list that you have not used recently. You can see the hidden options by clicking on a double arrow at the bottom of the menu.

Windows 2000 also includes all the goodies that come with Internet Explorer 5, such as the ability to drag items directly to, from, and within the Start and Favorites menus. You can shut off parts of the default interface, such as the Quick Launch bar next to the Start button.

FINALLY, A NOTEBOOK OS

One stellar leap for Windows 2000 ahead of Windows NT 4 is notebook support. Like Windows 98 Second Edition (SE), Windows 2000 supports power management on hardware with BIOS support for ACPI (Advanced Configuration and Power Interface), a power-management specification that lets the PC control power to peripherals and vice versa.

Our BatteryMark tests did not show improved battery life compared with Windows NT 4. Contrary to popular belief, ACPI will not give you noticeably improved battery life according to Microsoft and Intel. Like Windows 98, Windows 2000 also supports Plug and Play (PnP), including the hot-swapping of PC Cards.

Our favorite new feature is the Synchronization Manager. By marking a file or folder as available off-line in Windows Explorer, a user can continue to work on it when not connected to the network. When connected, the Synchronization Manager replicates any changes in the files to the network.

The Encrypting File System (EFS), new to Windows, makes it easy to encrypt files on

disk, providing an extra measure of security for stolen notebooks (a topic discussed further in "Security," page 126).

Microsoft has vastly increased the number of types of hardware supported by Windows 2000 to include DVD drives, Universal Serial Bus (USB) devices, Accelerated Graphics Port (AGP) graphics, certain multifunction adapters, and PC Cards. As with

Windows 98, Plug and Play hardware supported natively by Windows 2000 should install itself. When the OS detects new PnP hardware in the system, it identifies the hardware and offers to install the drivers. You have the option of installing the drivers from the Windows 2000 installation media, a floppy disk, a CD-ROM, or the Windows Update site. With non-PnP hardware, such as old Sound Blaster cards, you may have to run the Add New Hardware wizard. We had mixed success with both hardware and software after upgrading several desktops and notebooks, but you can expect third-party vendors to provide patches and driver updates for Windows 2000 on their Web sites. An inexperienced user may not make it through an upgrade, particularly from Windows 98. (For more detail, see "Setup and Migration," page 131.)

The Network Neighborhood folder in Windows NT 4 and Windows 98 has been replaced by one called My Network Places, which has a different layout. A new wizard called Add Network Place makes connecting to network resources, such as shared drives and printers, easier. You can also see and select FTP servers, Web servers, and other resources that use the WebDAV protocol.

You can use a Windows 2000 Professional system as a shared Internet connection. The Internet Connection Sharing (ICS) feature, first released in Windows 98 Second Edition, connects you to the Internet and uses the Network Address Translation (NAT) protocol to share a single IP address.

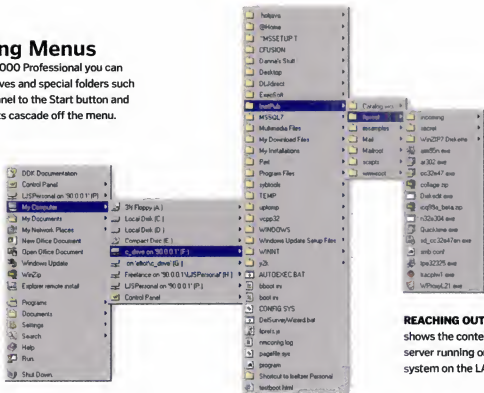
You'll also notice that many Windows NT administration features have moved

The Good, the Bad, And the Upgrade

Here are some of the highlights of our upgrade experience.

- Microsoft Office 95 applications worked well, as did Corel WordPerfect and Quattro Pro, holding onto custom toolbars and dictionaries.
- A Dell Pentium III/550 system upgrade from Windows NT 4 with MSDN, SQL Server 7.0, Office 2000 Developer Edition, Borland C++ Builder 4, JBuilder 3, and Interbase 5.5 worked very well.
- Upgrading an IBM 300PL from Windows NT 4 resulted in non-functioning audio devices.
- After an upgrade from Windows NT 4, a Toshiba Portégé 7100 notebook's RingCentral dialer/fax no longer worked.
- Upgrading a Dell Latitude CS resulted in a nonfunctioning Smart and Friendly Pocket CD-RW drive.
- A Linksys USB-to-Ethernet PC Card did not survive a Toshiba Satellite 4015CDS upgrade from Windows 98.
- The nVidia GeForce 256 driver on a Dell Pentium III/800 gaming machine did not provide hardware acceleration after the upgrade from Windows 98.
- Upgrading a Sony VAIO PCG-S05RX Pentium III/366 notebook from Windows 98 resulted in an overwhelming number of compatibility problems.

With Windows 2000 Professional you can drag network drives and special folders such as the Control Panel to the Start button and see their contents cascade off the menu.



REACHING OUT The last menu shows the contents of an FTP server running on another system on the LAN.

LEGACY HARDWARE: MAYBE

Hardware requirements are one of the main reasons Windows 2000 may not be the right system for all legacy desktops and notebooks. Microsoft lists 64MB as the recommended RAM requirement, but raising RAM to 128MB greatly improved performance on our tests. Windows 2000 also requires 650MB of hard disk space for installation. A 2GB hard disk should be adequate.

One stopgap alternative to a massive hardware upgrade for certain networked legacy systems might be found in Windows Terminal Server, a Windows 2000 feature that puts all the applications and power on a server and uses the client machine simply as a display and input device with a network connection.

Microsoft maintains an updated list of hardware it knows is

compatible with its various operating systems at www.microsoft.com/hcl/ and a list of Windows 2000-compatible hardware and software at www.microsoft.com/windows/professional/deploy/compatible/default.asp. If you have Windows 2000, you can run the setup program (Winnt32.exe) with the `/checkupgradeonly` switch and get a report detailing unsupported hardware and software on the system.

Windows 98 versions of programs that require direct access to hardware, such as antivirus software and several games, will not work under Windows 2000. Windows NT versions, if they exist, will work, however. You'll also have problems with programs with certain bugs that Windows 98 tolerates better than Windows NT. Pay special attention to all utility software and device-control software, such as proprietary scanning programs.

Despite upgrade hassles, Windows 2000 Professional is a worthy operating system for most business users.—LS

Here are some pros and cons to help you decide if you should make the switch from your current operating system to Windows 2000.

PROS

- Better stability and reliability
- Better performance
- Better data security
- Better device drivers
- Similar interface
- Plug and Play
- Supports DVD, USB, IEEE 1394, PC Cards, DirectX 7.0
- Equivalent support for the mobile user

- Upgrade can be difficult
- Fewer peripherals supported
- At least 64MB RAM required
- More complex system with more options

PROS

- Better stability and reliability
- Better performance
- Better data security and backup
- Smart-card support
- Plug and Play
- Support for DVD, USB, IEEE 1394, PC Cards, and Direct X 7.0
- Better mobile user features
- Better VPN client

- Administration of some system features has changed, requiring retraining
- Increased hardware requirements
- Not as much support for older notebooks

PROS

- Better reliability
- Enterprise-class directory with LDAP support
- Better DNS and DHCP support
- Leverage of Internet/intranet features via Active Directory
- Better data security
- Better desktop management
- High availability features
- Improved File and Print
- Improved performance in multiprocessor systems

CONS

- Increased complexity
- Many features require Active Directory
- Full migration to Native mode requires extensive planning and conversion of all Windows NT 4 servers to Windows 2000

Active Directory

rating ●●●●●

Active Directory may be the reason you switch to Windows 2000—or the reason you don't. Windows NT 4—based enterprises will be pleased that Windows NT's flat, unwieldy domain structure has been replaced in Windows 2000 with a true hierarchical, distributed directory service for managing resources across an enterprise or extranet. Windows 2000's Internet, security, and management features integrate tightly with Active Directory, as will Microsoft Exchange 2000 (Microsoft's messaging product) and several other third-party applications.

Directory services are nothing more than orderly ways of classifying and managing resources on a network, be they users, printers, servers, or security parameters. Directories become the points of reference for applications and user services. They help find a printer in a field office, locate a user and direct an e-mail, or verify that a user has access rights to a particular file. They also provide single sign-on, which gives a user access to the whole network from a single log-on. Directories are becoming increasingly important as business networks expand to include connections with business partners and customers.

When compared with other enterprise directories, such as Novell's Directory Services (NDS), Active Directory has its pluses and minuses, but it's a vast improvement over Windows NT 4's domains. Managing a single directory for multiple functions greatly reduces cost and complexity. And Microsoft has a good chance of seeing third-party applications integrate with Active Directory. Microsoft created the Active Directory Service Interface to rally third-party application support.

CAN YOU GET THERE FROM HERE?

The problem, for now, is getting there. Our testing showed that moving a large organization from domains to Active Directory requires extensive planning and testing. First you have to design a workable hierarchical directory structure—not an easy task. Then

you must decide how all your Windows NT 4 domains will fit into the new structure and who will manage it. In large organizations, this can be as much a political problem as a technical one.

In order to switch to what Microsoft calls Native Mode, which means that all your domains are integrated with Active Directory, Windows NT 4 shops will have to upgrade all of their Windows NT 4 domain controller servers to Windows 2000. Then they can use Microsoft's licensed version of Mission Critical Software's Domain Migrator, called Active Directory Migration Tool, or a third-party utility, such as FastLane Technologies' FastLane (www.fastlanetech.com) to reconfigure their domains. These programs have drag-and-drop interfaces and automatically move users and groups among domains as necessary.

Most NetWare-based organizations will not find good reasons to switch to Active Directory, unless they plan to abandon NetWare completely. If you do decide to make the switch, you will most likely begin by creating new domains, and then move objects from one directory to another a bundle at a time. Microsoft provides automation tools to handle directory migration on its Microsoft Services for NetWare 5.0. We suggest you create a test-bed and build expertise before trying it for real. You may use Active Directory in addition to NDS if you're running Windows 2000—based server applications such as Exchange.

Since every Active Directory domain uses a Domain Name System (DNS) name, some companies will find it useful or necessary to reconfigure their existing DNS infrastructure to match

YOU NEED ACTIVE DIRECTORY FOR...

- **Intellimirror**
- **Remote Installation Services (RIS)**
- **Delegation of administration**
- **Multimaster Replication**
- **Global Catalog**
- **Kerberos**
- **Two-way transitive trust**
- **Smart cards**
- **Quality of service (QoS)**
- **File Replication Service (FRS)**

YOU WANT ACTIVE DIRECTORY FOR...

- **Security groups** Enables groups spanning more than one domain or nested in other groups.
- **Domain Name System (DNS)** Provides one replication topology for AD and DNS.
- **Dynamic Host Configuration Protocol (DHCP)** Stores records of authorized DHCP servers.
- **Routing and remote access** Stores remote-access permissions and policy.
- **Virtual private network (VPN)** Provides strong encryption and smart-card authentication.
- **IP Security (IPSec)** Used to publish public keys and apply IPSec group policies.

Distributed File Services (DFS)

Clients can locate most local servers.

Encrypting File System (EFS) Used for certificate validation and defining EFS recovery policies.

Print services Users can search for printers by attribute.

Internet Information Server (IIS) Provides advanced authentication methods, such as certificates.

Group Policy Can define policies for sites, domains, and organizational units.

Certificate Server Can assign, manage, and revoke certificates.

Message Queuing Service Stores configuration and status information.

their Windows 2000 domain structure. Others will use a feature called Zone Delegation to register the new Windows 2000 DNS system into their existing DNS systems, handing off DNS requests to the Windows 2000 DNS server where appropriate.

We expect that most organizations will spend months planning before changing to Active Directory. In the meantime, Active Directory can coexist on a network with Windows NT 4 domains in what Microsoft calls Mixed Mode, replicating information to Windows NT 4 domains using the traditional flat format that they understand. Several features, including Internet Information Server and DNS and DHCP servers, work fine in Mixed Mode. To get the full benefit of Windows 2000's new management, remote-access, and security features, however, you must use Native Mode.

PEACEFUL COEXISTENCE

Novell's NDS has versions available to manage Linux, Macintosh OS, and Windows 3.1 clients; Windows NT 4 and Sun Solaris servers; and even mainframe operating systems. For now, Active Directory is only available for Windows-based clients and servers. In a partnership with Microsoft, Cisco plans to port Active Directory to Solaris and HP-UX—but not until at least six months after Windows 2000's release. For networks with both NDS and Active Directory, Microsoft provides Directory Synchronization Services for synchronizing changes in Active Directory with NDS and vice versa. Microsoft's acquisition of Zomet will lead to metadirectory features. For example, deleting a user within Active Directory would also remove the user from NDS, SAP R/3, and the mainframe.

ACTIVE DIRECTORY STRUCTURE

As part of its efforts to Internet-enable Windows 2000, Microsoft has built AD on two Internet standards: DNS, the standard for naming and locating domain names on the Internet, and LDAP Version 3, an Internet Engineering Task Force standard for exchanging directory information with clients and other directories.

Active Directory arranges domains in a hierarchical, tree-like structure that, like Novell's NDS, more accurately reflects the structure of most organizations (see the diagram "How Active Directory Works"). All objects in a tree share a common DNS namespace. Unlike Windows NT's domains, Active Directory can further subdivide domains into organizational units that contain other units or leaf objects, such as users, printers, and so on. If necessary, a company can create more than one tree (say, in a merger situation), or a forest.

How Active Directory Works

Active Directory arranges domains in a hierarchy and sets up two-way transitive trust relationships among all the domains in the tree.

Domains are broken down into organizational units that contain users, groups, and network resources. Domains and organizational units use DNS naming conventions.

DOMAINS



Trusts give user and group rights to traverse domains and are essential for single sign-on. In Active Directory all domains in a tree are automatically joined through a two-way, transitive trust (meaning that if domain A trusts domain B, and domain B trusts domain C, then domain A trusts domain C and vice versa). These are created using Windows 2000's Kerberos security infrastructure (for more, see "Security," page 126). This significantly reduces the complexity of maintaining trusts (they had to be manually configured in Windows NT 4). We were also pleased to find that Active Directory lets the administrator delegate administrative authority down to the Organizational Unit level, as opposed to Windows NT 4, which could only delegate to the domain level. So you can set more restrictive access to your

human resources department Organizational Unit or domain than to the sales Organizational Unit or domain, for example. Administrative rights do not cross domain boundaries, but rights granted to one Organizational Unit in the domain hierarchy can be inherited by all subordinate Organizational Units of the tree.

In contrast to NDS, user rights to other domain objects or common resources such as file servers cannot be assigned to an Organizational Unit. Rights must always be configured for individual users and groups. This can get complicated when there are lots of moves and changes.

Each domain has at least one Domain Controller, a server that contains directory information and responds to database requests or routing requests for resources. Windows NT 4's Primary and Backup Domain Controllers have been replaced in Windows 2000 by a peer model, in which any server can be promoted to Active Directory domain controller status without having to reinstall the OS. Multimaster Replication replicates changes made to any single controller to all other controllers.

In order to reduce the latency involved in routing requests to domain controllers across slow links, Active Directory also makes use of global catalog servers, which contain information about every object in the directory, though they store only the attributes that are most often requested.

To conserve bandwidth in slow connections, Active Directory only replicates changes, not entire objects. Active Directory also lets you regulate replication across slower WAN connections.

Scalability is one of Active Directory's principal improvements. For example, NDS partitions are limited to 1,000 objects, but Active Directory's can hold millions of objects and use indexed data stores.

Active Directory will help clinch Microsoft's place in the enterprise.—David Linthicum

Management, File and Print

rating ●●●●● rating ●●●●●

Windows 2000 brings Windows' file and print capabilities up to the same level as NetWare's. Perhaps more compelling for large Windows NT-based organizations (500 or more users), however, are the management features Microsoft has added to reduce the total cost of ownership (TCO) of desktop PCs. Novell offers similar capabilities in NetWare and ZENworks, and Microsoft has offered many of these features in its desktop

management product, Microsoft SMS, for years. You may want to consider these alternatives, as most of Windows 2000's TCO-reducing features work only with Windows 2000 clients and servers and Active Directory.

GROUP POLICY AND INTELLIMIRROR

Group Policy gives administrators far-reaching control over desktop and notebook computers on the network. It can be used to limit users' access to system files, desktop settings, and applications. For example, we removed access to the Network Control Panel applet for a group of users, preventing them from changing their network adapter settings or adding and deleting

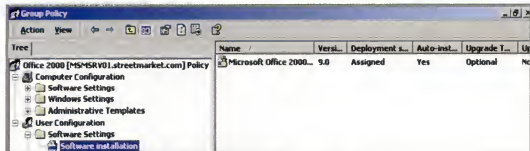
tally deletes a necessary application file, Intellimirror downloads it the next time the user launches the software.

FILE AND PRINT BASICS

With Active Directory, the administrator can set up disk quotas for users and groups—a storage-saving feature that has been standard in NetWare for several years. The administrator can map a drive letter to a single server subdirectory and can control access down to the file level.

The Distributed File System (DFS) lets you combine data on multiple servers into a single name. This is especially useful for large database applications that need to pull data from multiple locations. It was easy to create a dataset and distribute it across several different servers.

Many of the new print-related features require Active Directory. One of these, the automatic printer driver installation, lets you preinstall drivers for all of your printers on the network. If a user sends a print job but the user's PC lacks the correct drivers, Windows will auto-



REMOTE CONTROL The Group Policy editor lets you control client user settings and deploy software to both individual users and PCs.

REMOTE INSTALL Define a group policy, such as a software installation, and the action takes place when the user logs on.

protocols and services. Such measures can save hours of time spent fixing user-created problems.

We had heard a lot about Intellimirror but found it confusing at first, since it's not a single utility but a collection of applications. With Intellimirror, users can access their data, applications, and settings from any PC on the network; this is practical for users who travel among branch offices or in cases where users' PCs have to be replaced quickly. Notebook users can access their data even after they disconnect from the network. It was easy to redirect the My Documents folder on a desktop PC to a network location and set up off-line access.

Intellimirror lets you associate specific applications and desktop settings with users. When a user logs on to a new PC, the Windows Installer utility downloads and installs a copy of the user's associated applications if necessary. You can store settings, such as the background color of the desktop and IE Favorites, on the network, and they will follow the user to any network PC. Finally, you can set up self-healing applications; if a user accident-

ally push them down to the client. This works very well with the printer-search capability of Active Directory, which lets users look for a printer based on attributes such as color printing or paper-handling features. Windows 2000 supports the Internet Printing Protocol, so users can print across the Internet by entering a DNS or IP address.

BACKUP, RAID, AND STORAGE

A built-in backup utility codeveloped by Seagate and Veritas provides excellent storage management, including a scheduler and support for many tape devices.

Remote Storage Management (RSM) lets you off-load data that hasn't been accessed in a set period of time to tape or disk. Although this feature is powerful, we found its Microsoft Management Console interface a little confusing.

An improved software RAID controller is included as well. It works with Levels 0 through 5 and even allows level changes on the fly without rebuilding the array.—Steve Rigney

Application Services

rating ●●●●●

Windows 2000 provides better scalability and high-availability features for running large enterprise and Internet applications than Windows NT 4. We predict, however, that for at least another year the traditional high-end Unix platforms, such as Sun Solaris and HP-UX, which have features similar to Windows 2000, will continue to dominate. The chief competition will come from Windows 2000 Datacenter Server, which Microsoft plans to ship in mid-2000.

For the lower-end application developer deciding between Windows 2000 and Linux, the differences are not substantial. Both provide memory protection and virtual-memory management, and both support large-memory models—2GB with Linux and 8GB with Windows 2000 Advanced Server (64GB with Windows 2000 Datacenter). Both also offer process scheduling and SMP support: up to 16 processors for Linux and up to 8 processors for Windows 2000 Advanced Server (up to 32 for Datacenter). Linux provides operating-system source code, but most organizations will not mess with the code. There are hundreds of application-development tools available for the Windows 2000 platform, but only a few currently available for Linux, though this market is growing rapidly.

On our tests, Windows 2000 was stable for traditional application-processing using a single server. This included processing new COM+ applications and older Visual Basic applications. We set up a few unruly programs (such as one that writes to a null pointer) and watched them execute and fail, but the operating system kept on trucking. Windows 2000 was also slightly faster and more scalable than Windows NT 4.0 (see our ServerBench 4.1 test results, page 133).

GOT TO SCALE

Windows 2000 Server comes in three sizes: Standard Server Edition, Advanced Server, and the big gun: Windows 2000 Datacenter Server. Advanced Server supports 8 symmetrical processors and 8GB of memory. This product will find its niche in medium-size companies or organizations running an application-processing load of 100 to 500 users or with fairly busy Web or e-commerce sites. Windows 2000 Datacenter will take up to 64GB, and the 32 processors it supports will probably accommodate 1,000 simultaneous users with high application-processing demands.

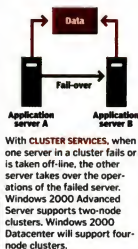
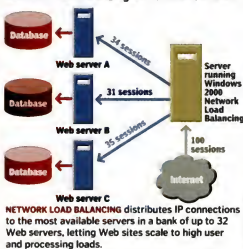
Windows 2000 Advanced Server and Datacenter Server come with two essential high-availability features for medium-size and large Web sites, and Microsoft's upcoming AppCenter will provide a third. For Web server farms, there's Web server load balancing, supporting up to 32 functioning servers in a cluster. Called NLB (Network Load Balancing), this kind

of load balancing distributes IP requests to the most available Web server in the cluster. It also provides fail-over and the ability to swap servers in and out without interrupting service. We found that NLB is limited to processing stateless events, such as simple read-only Web-page file service.

Simple two-server fail-over (four-server fail-over in Datacenter), in which one server takes over processing when another crashes, is provided through Microsoft Cluster Server (MSCS) and is a good fit for back-end database processing. All hardware used with Windows 2000 MSCS must pass a hardware

High Availability in Windows 2000

Windows 2000 Advanced Server offers two high-availability features, Network Load Balancing and Cluster Services.



compatibility test (HCT), so check with Microsoft before putting your legacy servers to work.

Component-Dynamic Load Balancing will appear with Microsoft AppCenter later in 2000. It will support up to eight connected application servers, providing the application developer with the ability to process one or many COM+ components across a cluster. Thus, a three-tier Web site could use NLB for the Web servers, Component-Dynamic Load Balancing for the application servers in the second tier, and fail-over for the back-end database servers. The complete package of Windows 2000 Advanced Server, Datacenter, and AppCenter will rival the performance and scalability of much costlier systems.—DL

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Internet Infrastructure

rating ●●●●●

Windows 2000 can come much closer than Windows NT 4 to carrying Internet, intranet, and extranet connectivity throughout your organization. It can handle just about any type of connection, from ATM to wireless, and provides excellent security. Its capabilities are similar to those of Novell's NetWare, but the popularity of Windows makes deployment and management less arcane. We especially like the Microsoft

Management Console (MMC) wizards, which can help with network setup tasks.

REACHING OUT SECURELY

We predict that the improved VPN (virtual private network) service found in Windows 2000 will be one of its most influential features. VPNs provide remote access and site-to-site connections via encrypted tunnels across the Internet, saving money on long-distance calls and leased lines and enabling secure connections among extranet partners. Microsoft has added support for the secure and widely used IPsec protocol in its VPN client, making VPN deployment, especially with third-party products, easier. Microsoft still offers the Point-to-Point Tunneling Protocol (PPTP) for companies that don't want to manage a public-key infrastructure and don't need the high security of IPsec.

IPsec VPN service encrypts TCP/IP traffic using powerful DES or triple-DES encryption and uses public-key encryption to establish authentication. Windows 2000 Server also includes the Layer 2 Tunneling Protocol (L2TP), which is used by many third-party products, in both the VPN client and server. If your network carries legacy NetBEUI or IPX traffic, L2TP can encapsulate those protocols within secure IPsec-encrypted TCP/IP packets for passage across the Internet. Perhaps the best feature is tight integration with Active Directory, which makes management less complicated than it is with other products.

The Remote Access Services (RAS) are a way to give employees within a local calling area access to the corporate LAN. If you have installed Active Directory, an ISP can use RADIUS (Remote Authentication Dial-In User Service), an access control protocol linked to Active Directory, to give clients a single log-on to the ISP's service and the corporate VPN. In the future, this function will provide a way for the ISP to offer special services to individual users dynamically.

Windows 2000 also includes router software and support for quality of service (QoS) features that would be practical in a small office or branch office. Today, QoS in Windows 2000 is a set of application program interfaces for developers, but when applications such as telephony ask for low delay or wide bandwidth, your Windows 2000-based router will understand the request.

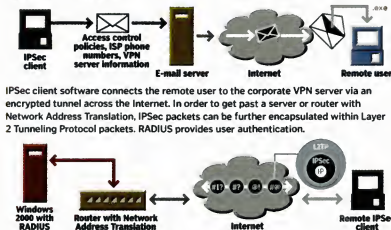
BUILDING BASIC CONNECTIONS

You can make several changes to the configuration of a LAN or WAN adapter without having to reboot. There's also a feature called Automatic Private IP Addressing (APIPA) that takes a lot of the strain out of setting up small IP networks. APIPA's functions include IP network address translation (IP NAT), so you don't have to beg your ISP for routable IP addresses to use inside your LAN.

In case you need routable IP addresses inside your LAN, Windows 2000 includes a DHCP server, with excellent management features that report on how addresses are used, and a DNS server. Domain names on Windows 2000 Server are DNS names when Active Directory is running. The DNS in Windows 2000 is an implementation of the draft IETF Dynamic

Virtual Private Networking

You can use Windows 2000's Connection Manager and Administration Kit to distribute e-mail attachments containing VPN client software configured for your company's VPN connections.



IPsec client software connects the remote user to the corporate VPN server via an encrypted tunnel across the Internet. In order to get past a server or router with Network Address Translation, IPsec packets can be further encapsulated within Layer 2 Tunneling Protocol packets. RADIUS provides user authentication.

DNS standard. Active Directory uses Dynamic DNS, which lets you give fixed names to resources, even though they get dynamic IP addresses, thus shrinking the pool of fixed IP addresses you have tied up.

Though we were impressed with the DNS, we did have to disable another active DNS server on our test LAN to avoid a lot of error messages during start-up. You should establish an isolated subnet when first bringing up the DNS.

Microsoft delivers a comprehensive bundle with the building blocks for a flexible, reliable, and secure intranet or extranet operation in organizations of all sizes.—Frank J. Derfler, Jr.



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Security

rating ●●●●●

Networks and individual systems can be far more secure under Windows 2000 than under Windows NT 4. Financial institutions and other organizations or departments with strict security requirements will find much of what they need in the new operating system. Making full use of Windows 2000 security, however, means embracing Active Directory and requires considerable management attention and significant training.

Authentication—determining that users are who they claim to be—has undergone an overhaul in Windows 2000. If you decline to take on Active Directory, the Server versions will still support Windows NT 4's NTLM (Windows NT LAN Manager) protocol for authentication of legacy clients, but Active Directory comes with support for Kerberos 5.

Kerberos's biggest benefit is single sign-on, after which a client can access other Windows 2000 servers on the network without reauthentication. Kerberos uses a special server called a Key Distribution Center (KDC), which on Windows 2000 must be a domain controller. The KDC issues "tickets" that a client can offer to other servers for authentication. In contrast to NTLM, Kerberos can be used to authenticate servers to each other; it also lets clients authenticate servers. Single sign-on extends to non-Windows 2000 servers with other Kerberos 5 implementations or through trusted digital certificate authorities. As with Windows 98, Windows 2000 Professional clients can authenticate with smart cards conforming to the PC/SC 1.0 specification.

Windows 2000 has an infrastructure for public-key encryption. The Certificate Services can issue, manage, and revoke digital certificates, which are password-protected, encrypted data files that include data used to identify transmitting systems. Corporate-based certificate servers can be used to authenticate clients and servers to each other or to encrypt data across insecure connections—essential for business-to-business e-commerce.

Windows 2000 can use IPsec, an encrypted IP protocol, to encrypt data on the wire. Similarly, it can use SSL and the newer TLS

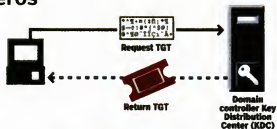
specifications for encrypting data at a higher transport layer. Both of these can be set as mandatory policies in Active Directory for communication between specific clients and servers. And Windows 2000's public-key encryption is the basis for its VPN support.

But the coolest use of encryption in the OS is the Encrypting File System (EFS), which lets you encrypt files stored on the disk

Windows 2000 Kerberos

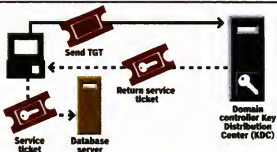
CLIENT LOGS ON TO THE NETWORK

When the user logs on to the network, the client sends a request for a Ticket Granting Ticket (TGT) to the Key Distribution Center (KDC) located in the domain controller. The request contains a time stamp encrypted with a hash of the user's password, which can be decrypted only by the domain controller.



CLIENT REQUESTS ACCESS TO A DATABASE SERVER

When the user wants to access another service on the network, the client sends a TGT to the KDC. The KDC creates and encrypts the service ticket and sends it to the client. The client then presents the service ticket to the requested server, which has the secret key to decrypt it.

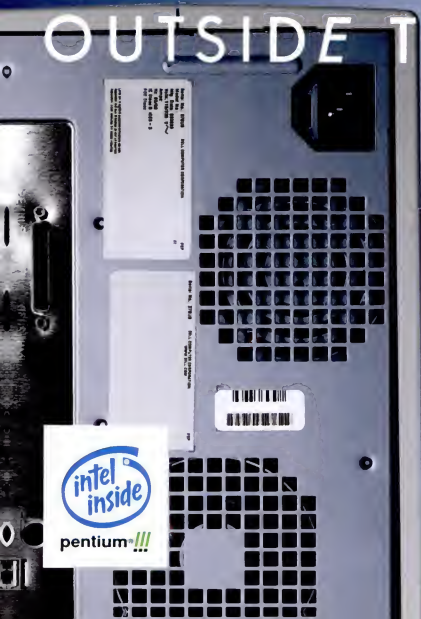


using keys only individual users and an authorized recovery agent can decrypt. EFS improves the security of systems vulnerable to theft, such as mobile computers. Unless the data thief knows the user's password, he or she can't get at the encrypted data. And EFS is easy to use; encryption is just another file or folder attribute.

Default rights for users in Windows 2000 are more restrictive than in Windows NT 4. For example, we found that if a user does not have write access to the Program Files\Netscape\Communicator\Users folder, Netscape Communicator will fail, because it needs to write its profile information there. You can address problems like this by making users members of more powerful groups or by micromanaging rights as necessary. Using applications that comply with the Windows 2000 Application Specification also solves this problem. Advance planning is mandatory for effective use of the vast security facilities in Windows 2000. If you are to be responsible for the security of a Windows 2000 network, you will do well to investigate training on the topic.—LS

Our contributors: **Larry Seltzer** is a frequent contributor to PC Magazine; **David Linthicum** and **Steve Rigney** are contributing editors. **Nick Stam** is PC Magazine Labs' technical director for hardware; **Andrew Garcia** is a technical analyst. Executive editor **Leon Erlanger** and PC Magazine Labs project leader **Russ Iwanchuk** were in charge of this story.

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Setup and Migration

rating ●●●●●

Microsoft has put a lot of effort into making the installation of Windows 2000 as easy as possible. Experienced users will be pleased with Microsoft's online compatibility lists, links to third-party driver updates and patches, hardware update site, and improved installation wizards. Unfortunately, during our extensive testing of desktops and notebooks upgrading from Windows 95, 98, and NT 4 to Windows 2000 Professional, we

ran into a host of problems (see the sidebar "The Good, the Bad, and the Upgrade," and look for our detailed summary online). We found particular problems with nonfunctioning multimedia hardware and software, including audio devices, printers, CD-RW drives, USB devices, and graphics cards and software. The average corporate IT department will have the expertise to overcome many of these problems but will have to download multiple patches and driver updates from third-party Web sites. Upgrades

from Windows 98 were particularly difficult. You may be better off uninstalling your applications and reinstalling them after upgrading the OS. Less experienced users may find upgrading too much of a challenge.

Full migration to Active Directory is also a formidable task. Directory migration is discussed in more detail in the Active Directory section.

The hardware requirements for Windows Professional are reasonable. You need 64MB of RAM and 1GB of disk space. Windows 2000 Server requires a 133-MHz Pentium with 900MB of available disk space and at least 128MB of RAM.

WINDOWS PROFESSIONAL

To begin a Windows 2000 Professional or Server installation from CD, it is recommended that you first run `\i386\winnt32 /checkupgradeonly` from the installation CD to check for possible hardware compatibility problems. You can expect many of your Windows 9x applications to run in Windows 2000. There are some problems, however, with system-level software, such

as virus protection and third-party systems-maintenance utilities. Check with your software vendors.

After scanning for compatibility, Windows 2000 creates a report found at `c:\windows\upgrade.txt` that lists all the complications you may find when upgrading your particular system. Our typical upgrade took between 45 and 90 minutes. The network-based installation of Windows 2000 is tricky, but once you get the configuration right you can install thousands of nodes

DOMAIN TO DNS Active Directory uses DNS domain names. Legacy WINS clients use the Windows NT 4 domain names until they are upgraded.

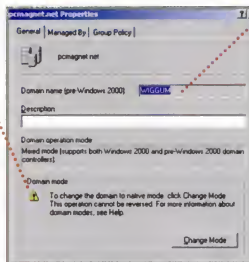
using a common configuration and thus minimizing errors. To set this up you must first copy files from the `\i386` directory found on the Windows Professional installation CD to a shared directory on the file server. You need to install Setup Manager in order to create an unattended answer file.

INSTALLING SERVER

We upgraded an existing Windows NT 4 Primary Domain Controller (PDC), then two Backup Domain Controllers (BDCs). We then switched from Mixed Mode to Native Mode, which transforms all Windows NT 4 domains into Active Directory domains. The PDC upgrade took 2 hours; the BDC upgrades took 45 minutes each.

Once we selected the Per Seat Licensing Mode for each server, we needed to enter the computer name, account, and password and select the components to install. Next we provided the IP address for the server and set the workgroup domain name.

Make sure to disconnect the Backup Domain Controller so that if something goes wrong, you can simply promote it. And back up your PDC before upgrading.—DL



WINDOWS 2000 PRICING		LIST PRICE	DESCRIPTION	PROCESSORS SUPPORTED	MEMORY SUPPORTED	NETWORK LOAD BALANCING	SERVER CLUSTERING
Windows 2000 Professional		\$319	Standard product	2	4GB	None	None
		\$219	Upgrade from Windows 95 or 98				
		\$149	Upgrade from Windows NT Workstation				
Windows 2000 Server		\$1,199	Standard product (with 10 client access licenses)	4	4GB	None	None
		\$999	Upgrade from Windows NT Server (with 10 client access licenses)				
		\$1,199	Upgrade from Windows NT Server Enterprise Edition (with 25 client access licenses)				
Windows 2000 Advanced Server		\$3,999	Standard product (with 25 client access licenses)	8	8GB	32 nodes	2 nodes
		\$1,999	Upgrade from Windows NT Server Enterprise Edition (with 25 client access licenses)				

BENCHMARK TESTS

Windows 2000



Windows 2000 Server performed better than Windows NT 4 Server across the board. In desktop performance Windows 2000 Professional was mostly unremarkable compared with Windows NT 4.

WINDOWS 2000 PROFESSIONAL

PC Magazine Labs ran a variety of standard benchmark tests on Windows 98 SE, Windows NT 4 Workstation, and Windows 2000 Professional using several memory sizes. The ZD Business Winstone 99 test results showed Windows 2000 Professional's performance running typical business applications equivalent to that of Windows NT 4 Workstation. Both operating systems were faster than Windows 98 SE. Where Windows 2000 really excelled—beating Windows NT by as much as 22 percent in some

noticeably when we moved from 64MB to 128MB across all platforms. On the desktop systems, Windows NT 4 using FAT16, edged out Windows 2000 using FAT32 at both 64MB and 128MB but was slightly slower at 256MB. Under NTFS at 128MB, Windows NT 4 scored 3 percent higher than Windows 2000.

Testing Windows 2000 with 3D WinMark was problematic—surprising, considering that this was final code for the OS. We learned from Microsoft that Windows 2000 supports very few 3-D graphics boards properly, so most users will have to download upgraded drivers. Although the new OS includes Direct 3D, the driver for our popular Diamond Viper V770 card did not support a Direct 3D Hardware Abstraction Layer (HAL), so our 3D WinMark tests could not take advantage of hardware acceleration. We contacted nVidia and obtained a newer driver (Version 3.64) that supports Windows 2000 and presents a 3D HAL. Windows 2000 outperformed Windows 98 SE, but this was because we forced the Windows 98 driver to execute our

DESKTOP SCORES

▲ High scores are best.
▲ Low scores are best.
Bold type denotes first place.

	ZD Business Winstone 99				ZD Content Creation Winstone 2000				ZD 3D WinMark 2000	i-Bench 3D Complex Pages	mem. MB
	64K	64K	NTFS	64K	64K	64K	NTFS	64K	64K	128MB	128MB
Windows 2000 Professional	27.9	32.1	30.3	32.8	18.4	25.6	24.7	N/A ¹	30.8	18.1	52,254
Windows NT 4	28.4	33.2	31.3	32.3	18.8	21.8	20.2	24.7	N/A ²	16.2	52,166
Windows 98 SE	23.4	25.2	N/A ³	25.2	21.5	22.9	N/A ³	25.0	26.4	30.4	52,431

N/A¹—Not applicable: The software did not complete this test. N/A²—Not applicable: 3D WinMark does not run under Windows NT.
N/A³—Not applicable: Windows 98 does not support NTFS.

On Content Creation Winstone,

Windows 2000 outperformed Windows NT by more than 22 percent under NTFS and 17 percent under FAT on the desktop system at 128MB, no doubt a benefit of Windows 2000's better memory management and support for IDE DMA. At the lower, 64MB memory settings, Windows 98 actually scored best.

NOTEBOOK SCORES

High scores are best.
Bold type denotes first place.

	ZD Business Winstone 99				ZD Content Creation Winstone 2000				ZD BatteryMark 3.0
	64K	64K	NTFS	64K	64K	64K	NTFS	64K	64K
Windows 2000 Professional	N/A ⁴	N/A ⁴	21.7	25.8	15.0	19.8	19.8	2.57	
Windows NT 4	21.7	27.4	N/A ⁴	25.6	14.5	19.7	18.9	3.01	
Windows 98 SE	19.8	22.4	N/A ⁴	N/A⁴	16.5	19.1	N/A ⁴	3.06	

N/A⁴—Not applicable: Windows 98 does not support NTFS.
N/A⁵—Not applicable: We did not run the test for this configuration.

▲ **Windows 2000 Professional's** scores on our notebook tests were mostly equivalent to those of Windows NT 4 but better than

those of Windows 98. ZD BatteryMark 3.0 scores were also equivalent, as ACPI does not significantly affect battery life.

configurations—was on ZD Content Creation Winstone 2000, which measures the performance of multiple applications used to develop Web content. This was because of Windows 2000's use of Direct Memory Access for IDE transfers versus Windows NT 4's programmed I/O. Windows 2000 also did exceptionally well on ZD 3D WinMark 2000, though a driver upgrade was required, and we found out that the OS does not natively support many of the graphics boards on the market. Running ZD i-Bench, Windows NT 4 displayed Web pages slightly faster than Windows 2000 did. Both operating systems were much faster than Windows 98 SE. We tested a single notebook and found that with ACPI support in Windows 2000, notebook battery life was no better than with Windows NT 4.

As expected, Business Winstone performance improved

test properly, which slowed it down. We ran i-Bench on the desktop systems only at 128MB because of a lack of differentiation at other tested memory sizes. Windows NT 4 and Windows 2000 each outperformed Windows 98 SE by a wide margin on our Load Complex Pages test. Windows NT 4 edged out Windows 2000 by a slim margin.

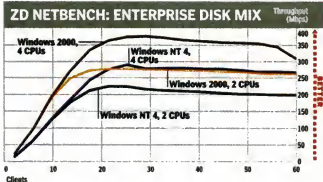
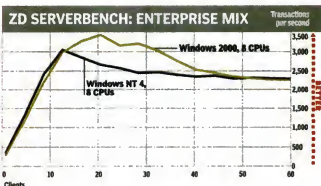
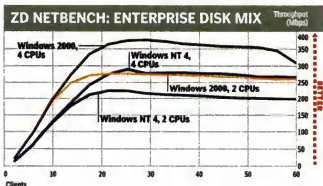
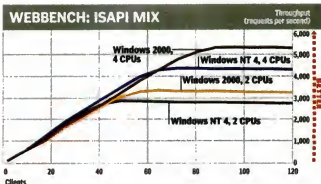
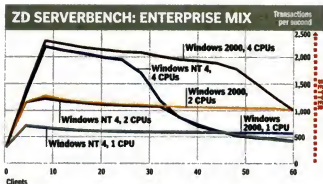
Our BatteryMark 3.0 tests use ACPI to manage the screen (keeping it on) but does not use any other lower-level ACPI device management. We found similar battery life results under all operating systems.

We used a Dell Dimension XPS T350 as our desktop test-bed and a Compaq Armada M700 corporate system as our notebook test-bed (for more configuration and testing information, go to www.pcmag.com).—Analysis written by Nick Stam

WINDOWS 2000 SERVER AND ADVANCED SERVER

Windows 2000 Server's performance surpasses that of Windows NT 4 Server. Our benchmark tests showed cross-the-board improvement for several network-server functions including file and print, application service, and serving up Web pages. Architectural enhancements in network communication, multiprocessor scaling, and file-system components account for the overall boost.

Our NetBench 6.0 Enterprise Disk Mix scores represent a typical high-load file-server scenario. It was on this test that we saw the most dramatic performance gains. With only two CPUs Windows 2000 easily matched Windows



▲ Faster all around. Windows 2000 Server outperformed Windows NT 4 on every test, thanks to improved networking and operating system components. The biggest performance increase was on

NetBench, where Windows 2000 running on a two-CPU system performed as well as Windows NT 4 on a four-CPU system, and performance on a four-CPU system was 30 percent faster.

NT 4's high-water mark with four CPUs. At peak performance, Windows 2000, running with four CPUs scored a nearly 30 percent improvement over Windows NT 4's highest numbers with four CPUs. These differences are mostly due to a new version of Server Message Block (SMB) and improved TCP/IP networking for routing traffic. Of particular note is the new ability to off-load Checksum to network adapters. (Checksum is the mathematical calculation that verifies the accuracy of network data packets.)

For Web serving the newest version of the Internet Information Server (IIS 5.0) has an improved caching mechanism and the ability to parse data more effectively

for handling the static content of our WebBench 3.0 tests. Windows 2000 Server's new TCP/IP driver interface and its optimization of the driver code improves the way network connections are established. In fact, on our WebBench 3.0 Static Mix tests, we were unable to arrive at a peak score on our four-CPU test, even with 120 clients pounding the server. On the WebBench 3.0 ISAPI Mix testing, which includes 20 percent dynamic content, with four CPUs we measured a 22 percent improvement over Windows NT 4 at peak scores.

The ServerBench 4.1 Enterprise Mix test portrays an application server environment. While here Windows 2000 didn't have huge performance advantages over Windows NT 4, it did sustain higher numbers over the run of the test as well as better peaks with a large number of CPUs.

Our only eight-CPU testing of Windows 2000 Advanced Server showed its superior ability to scale, with a peak of over 12 percent better at 20 clients versus the best score of Windows NT 4 at 12 clients. With four CPUs, there was a difference at the peak of a little over 5 percent.

Distinct dips in the Windows NT 4 test results with two and four CPUs indicates reliance on the disk subsystem after caching limits were exceeded.

There was no difference when we tested single CPUs. At two and four CPUs, however, we noted extreme performance declines by Windows NT 4 at 32 and 24 clients respectively. Because of its new algorithm for file caching and its ability nearly to double virtual file-system cache space to 960MB, Windows 2000 can keep data in faster system memory and avoid going to disk.—*Analysis written by Andrew Garcia*

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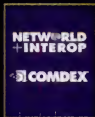
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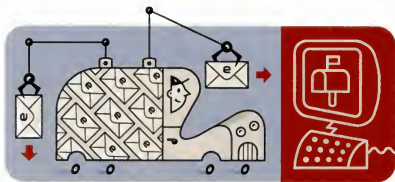
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news—and to get their feedback. Or you can publish an e-mail discussion list, in which every member of the group can



BY JESSE BERST

ILLUSTRATIONS BY BOB DALY

The E-Mail Push

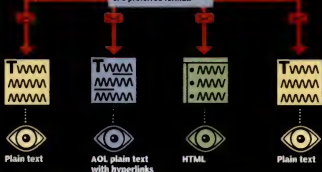
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IN THIS REVIEW

- 137 eGroups
- 138 EnvoyMail
- 138 ListPlex
- 139 Microsoft bCentral's ListBot
- 140 PostMaster General
- 144 SparkList
- 144 Topica
- 145 UnityMail Express
- 137 Editors' Choice
- 139 8 Secrets of a Winning E-Mail Newsletter
- 140 Summary of Features

Our contributors: **Jesse Berst** is the founder and editorial director of ZDNet AnchorDesk, an e-mail news alert and Web site (www.anchordesk.com) and the author of the upcoming book *The Magnet Effect*. **Brett Glass** is a freelance writer. Associate editor **Sean Carroll** and PC Magazine Labs project leader **Oliver Kaven** were in charge of this story.

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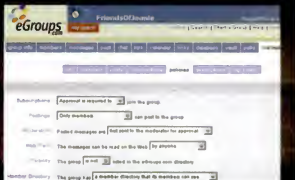
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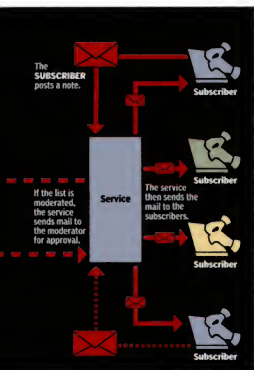
To help you with that task, we tested eight e-mail outsourcing services. We set up accounts with each provider, starting with its basic offering and then upgrading to more advanced services if they were available. Our conclusion: Businesses with smaller mailing lists should consider free, ad-supported products such as eGroups, Microsoft bCentral's ListBot, and Topica. Those with longer lists should check out service bureaus such as EnvoyMail, ListPlex, SparkList, PostMaster General, and UnityMail Express. Or consider e-mail campaign providers such as eGain Communications, Exactis.com, and Kana Communications.

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We like services that let us ask subscribers demographic questions during the sign-up process. At its simplest level, this lets you understand your audience better. A few of the services even let you use this information to target your messages more carefully. Imagine you're selling rare musical recordings, for example. With good customer-demographics information, you know whom on your list to target when an obscure Thelonious Monk record turns up. You can send out a broadcast alerting just the jazz aficionados—without annoying your Bob Dylan bootleg collectors.

For discussion lists, we like that eGroups and Topica let subscribers participate via the Web if they want to. Some discussion services let users receive the day's messages in a single, digest message to cut down on mailbox clutter. If you choose to let members post to your list,

think carefully about whether you trust the subscribers to post directly or whether you'd prefer to moderate and be able to screen posts before they hit the list.

More and more companies are interacting with their customers through e-mail publishing. Keep in mind that more and more customers are starting to suffer from "in-box fatigue" and will be seriously turned off by junk e-mail. But if you tailor your lists carefully and make sure your messages have real substance and relevance, e-mail could be the tool that makes your e-commerce business stand out.

ALL REVIEWS BY BRETT GLASS

eGroups

Free. eGroups.com.; 415-284-6900;
www.egroups.com. ●●●●



eGroups stands out as a bargain among commercial mailing-list services. eGroups will maintain your list for free if you're willing to put up with advertisements attached to every posting. If you don't want ads (which could come from competitors), you pay \$5 monthly per list, billed annually in advance.

With such an ambitious business model, you might expect eGroups to be a bare-bones service. In fact, it has one of the richest feature collections in this roundup. Each mailing list can be broadcast only, moderated, or unmoderated.

eGroups lists come with extras that no one else provides, including a chat room, a 20-MB file library (or "vault"), individual and group event calendars, a polling facility, an audio talk room (a sort of computerized, online conference call), and a database (a small collection of spreadsheet-like tables). Unfortunately, you cannot expand limits on some of these facilities (the maximum size of the vault, for example) unless your list generates enough ad revenue to qualify for eGroups' PowerList program.

eGroups polls let you post a multiple-choice or checklist-style questionnaire and tally the results. But the poll can't gather text responses, you cannot require the subscribers to answer the poll before joining, and the service gives you no way to integrate the tallied data for use with targeted mailings.

eGroups incorporates many antispying measures, some of which are under wraps so as to take spammers by sur-



FREE:

eGroups

FEE-BASED:

SparkList

From surprisingly robust GUI-based cheapies to the austere, powerful text-based services, there are many e-mail publishing services available to help get the word out.

On the inexpensive end, eGroups is the clear choice. Free service, rich features, easy e-mail or Web access, sufficient archiving, and simple setup make eGroups a convenient way to maintain an e-presence without bankrupting yourself. One caveat: eGroups works best for those who already understand their readership demographics. eGroups neither gathers nor lets you make use of detailed profiles of your readers. Simple polling features exist but cannot be used to perform mailings at targeted reader subsets.

The other free services in this roundup, Microsoft bCentral's ListBot and Topica, both offer solid features. Neither, however, can match eGroups' rich groupware.

For those with deeper pockets and a greater need for power, SparkList is the winner—by a nose. SparkList is clearly for the savvy user who can supplement its powerful features by adding Perl scripts. One major drawback is SparkList's lack of integrated demographics tools. If you need to gather demographic data you should check out L-Soft's ListPlex. MessageMedia's UnityMail Express gets an honorable mention for its powerful management features, but the cost may put it out of reach. And MindShare Design's PostMaster General offers good security but lacks the customization tools of some of the other paid services. Ist Net Technologies' EnvoyMail has a slick interface and makes good use of demographics but is still very much under development.



MORE ON THE WEB: Visit Sitefinder and Related Sites (page 111) for the services mentioned in this story. You'll also find list-publishing tips and software for hosting your own list. www.pcmag.com



SCORECARD

For the administrator, content management and subscriber management are critical to the quality of the published content of e-mail newsletters. Reporting tools give an overview of list performance and functionality. Archiving and spam protection both benefit the list owner and the subscriber. Backup and security

tools preserve the list's integrity. Ease of interaction with the service's subscriber interface is essential to subscriber satisfaction.

YOUR CUSTOM SCORECARD: To find the e-mail publisher that best meets your particular needs, create your own custom scorecard online (www.pcmag.com). Just tell us what matters most to you and get an instant ranking of the e-mail publishers according to your priorities.

RED denotes Editor's Choice.

	*****-EXCELLENT	****-VERY GOOD	***-AVERAGE	**-FAIR	*-POOR	Content management	Subscriber administration	Reporting	Archiving	Spam protection	Backup and security	Subscriber interface	OVERALL
eGroups	***	***	***	***	***	***	***	***	***	***	***	***	***
EnvoyMail	***	***	***	***	***	***	***	***	***	***	***	***	***
ListPlex	***	***	***	***	***	***	***	***	***	***	***	***	***
Microsoft bCentral's ListBot	***	***	***	***	***	***	***	***	***	***	***	***	***
PostMaster General	***	***	***	***	***	***	***	***	***	***	***	***	***
SparkList	***	***	***	***	***	***	***	***	***	***	***	***	***
Topica	***	***	***	***	***	***	***	***	***	***	***	***	***
UnityMail Express	***	***	***	***	***	***	***	***	***	***	***	***	***

prise. During testing, we couldn't import a large batch of addresses to our new list all at once; instead, we had to paste them into a Web form in small bunches. eGroups considers adding more than 40 members at one time to be a sign of spamming, so the request must be reviewed by eGroups' staff.

Despite these quirks, eGroups does offer a few features that no one else can match. If your needs fit within eGroups' constraints, you'll have difficulty imagining a better choice to host a basic announcement list, mailing list, or discussion group.

EnvoyMail

Setup fee, \$99; \$5 per month (1,000 messages). List Net Technologies Inc.: 888-282-6255, 858-675-4449; www.lstnettech.com. ●●●

EnvoyMail, a broadcast-only service from List Net Technologies, is still under development but already looks good. We especially liked its Web-based questionnaire editor, which makes creating a GUI sign-up sheet—with radio buttons, drop-down lists, and blanks for demographic infor-

mation—simple and fun. You'll find using these demographics to send messages to a select subset of list members easy.

EnvoyMail helps you gauge the response to your mail by providing trackable links, which trigger counters and forward users to specified pages. Administrators can view graphs of sign-up activity for the last month.

A 30-day free trial account lets you get acquainted with the service and has surprisingly few limits—so few, in fact, as to raise concerns. EnvoyMail does not, for example, require a confirmation e-mail to be returned by users, leaving the service vulnerable to list bombing.

EnvoyMail's three tiers of service vary in the amount of hand-holding you get and how you're billed (number of members versus number of messages). Prices start at \$99 for setup, and either \$99 per month or \$5 per 1,000 messages sent.

During our tests, EnvoyMail's developers were still fleshing out features and fighting bugs, so we weren't surprised to find a few rough spots. Online help was minimal, and some pages had HTML er-

rors and misspellings. We got an ODBC error message on our Web browser screen when we attempted to upload a large list of new members (due to a bug in Envoy's interaction with Microsoft's SQL server). Technical support is handled via e-mail.

Unlike most of its competitors, EnvoyMail does not let you download a snapshot of your database. To do so, you have to e-mail the company and request a manual extraction. This situation is not acceptable; as the list owner, you should have control of the data at all times. Automatic bounce handling was in the works, but during our tests our bounces were simply returned to us.

Our general reaction to this service is: "Watch this space." Though it can't yet compare to systems such as SparkList for power, flexibility, and features, EnvoyMail has a strong interface and shows great promise for the future.

ListPlex

\$500 per year (1,000 messages) plus 4 cents per subscriber. L-Soft international Inc.: 800-399-5449, 301-731-0440; www.lsoft.com. ●●●●

ListPlex is a list-hosting service provided by L-Soft international, which develops and licenses Listserv mailing-list management software. Developed in 1986 for IBM mainframes, Listserv now runs on dozens of platforms, including Microsoft Windows NT and Unix. The name Listserv commonly referred to any mailing-list server until L-Soft registered Listserv as a trademark in 1996. Here, Listserv refers specifically to L-Soft's product.

The advantage of Listserv (and hence ListPlex) is in the powerful, text-based server software, which was efficient when mainframes had less computing power than hand-held devices do today. Listserv screams on today's hardware.

ListPlex and its associated service ListPlex Ease (in which customers share a server) are pricey and highly customizable. They're also among the few services that offer guaranteed, timely delivery of critical documents such as stock newsletters. Fixed-cost packages are available starting at \$500 per year and \$0.04 per subscriber; compare that with a similar program, SparkList, which starts at \$50 per month. But L-Soft encourages tailor-made—and priced—packages. You can pay L-Soft to administer everything, but chances are you'll want to do at least some management yourself. The

lowest-level sample plan for businesses on L-Soft's Web site costs \$500 per month, plus varying volume and per-subscriber costs, which are worked out according to a complex set of formulas.

Listserv's default Web administration interface is spartan; the program expects you to know what you're doing. The management page, for example, does not have a Help button, but online documentation is available. The GUI is really a command generator that creates text commands and sends them to Listserv's underlying interface. Users can subscribe, unsubscribe, and search archives through an optional Web interface.

Autoresponders, subscription confirmation, bounce handling, and digests are all part of the default configuration of a ListPlex account. Support for demographic data is available at extra cost via a back-end database. Listserv doesn't provide a GUI interface that lets you compose a questionnaire, however. You'll need patience and technical knowledge—or you'll need to pay for consulting time—to get one up and running.

Ultimately, ListPlex is best for large lists and for those where guaranteed timely delivery is necessary.

Microsoft bCentral's ListBot

Free. Microsoft Corp.: 425-882-8080;
www.listbot.com. ●●●

Microsoft inherited ListBot with the purchase of LinkExchange, and the company continues to run it as a free part of MSN. An advertising-supported service, Microsoft bCentral's ListBot is a straightforward mailing-list maintenance system with few bells and whistles.

For \$99 per year per list you can subscribe to ListBot Gold, a paid option that

8 Secrets of a Winning E-Mail Newsletter

1. Keep it brief. Busy customers put long newsletters aside to read later, but when old issues stack up, they unsubscribe.

Short newsletters—of four screens or fewer—get opened and read more often.

2. Don't be a tease. Saving details for the Web site is fine, but the e-mail has to provide value as well. If it doesn't, customers will stop opening it.

3. Write for scannability. This is the Internet Age. Everyone's busy. Give it to them straight and quick.

4. Format for scannability. Set margins at 70 characters or fewer to avoid awkward line wrapping. Use every trick in the book—caps, asterisks, dashes, white space—to set items apart.

5. Hurl the URL. For each item and ad, include the relevant URL. Make jumping to your site for details easy.

6. Embed the commerce. Surround ads and offers with relevant content. Never put an ad at the top. If readers see an ad in their preview panels, they're likely to hit Delete.

7. Refine the content formula. Give time-sensitive information (news, stock prices, gossip, limited-time specials) so readers will want to open your newsletter today. Include reference information (tips, how-tos) so they'll save your e-mail for tomorrow. Add incentives (contests, giveaways, exclusives) to appeal to their self-interest.

8. Remember: Headlines matter. Always write a new headline for each issue and make it stand out.—JB



offers minor enhancements such as eliminating ads, offering easily customized demographic questionnaires, and letting the list manager import lists. But even this premium service pales in comparison

to eGroups' free offerings. ListBot Gold has nothing to match eGroups' advanced services such as calendars, chat rooms, and file libraries.


We found ListBot relatively simple to navigate and administer. Each list gets its own domain name. Connecting to the virtual Internet host listname.listbot.com takes you right to the


list's home page. The administrator can control whether the list is public or invitation-only; whether it's a broadcast-only, moderated, or unmoderated list; and the degree to which membership is restricted.

ListBot can require that demographic information be entered before a member can subscribe, but the service can't do much with the data except tally and execute searches. We found no way to send a message to only those members who met certain criteria. But ListBot does permit you to download the list in a variety of simple text formats, so in theory, you could do your own targeted mailings based on that data. An HTML generator creates simple sign-up, removal, and archive-search links for your Web pages.

Support for ListBot is limited to a few

LISTBOT'S FREE
level of service
lets you add up
to ten members
at a time to your
list.





SUMMARY OF FEATURES

E-Mail Publishing

download at
www.pcmag.com

■ YES ■ NO	eGroups	EnvoyMail	ListPlex	Microsoft bCentral's ListBot	PostMaster General	SparkList	Topica	UnityMail Express
SERVICE								
Free service	■	■ (30-day trial)	□	■	■ (up to 20 subscribers)	□	■	■
List price (1,000 subscribers)	Free (\$5 a month without ads)	\$99 setup plus \$5 a month (up to 5,000 messages)	\$500 a year plus setup fee and per-message charges	Free (\$99 a year with premium services)	\$20 a month (3,000 subscribers)	1,000 e-mails, \$1 (\$50 a month minimum)	Free	\$2,500 setup plus \$500 a month (20,000 messages)
Virtual domain support	□	■	■	Optional	■	■	□	■
Spam filters	■	■	■	□	□	□	□	■
Mail-merge support	□	■	■	□	□	□	□	■
ADMINISTRATION								
Autorespond features	□	■	■	□	■	■	■	□
Automatic bounce and error handling	■	□	■	■	■	■	■	■
List owner can include demographic questionnaire	■	■	■	■	□	□	□	■
Administrator can schedule mailings	■	■	■	■	■	■	■	■
Upload/Retrieval of customer database	□	■	■	□	■	■	■	■
Back-up frequency	Continuous	Daily	Daily	Daily	Daily	Daily	Daily	Daily
Archives accessible to users/Access can be restricted	■	□	■	■	■	■	■	■
Mail delivery reports	□	■	■	□	■	■	□	■
Subscriber can manage membership by Web/e-mail	■	■	■	■	■	■	■	■
CONTENT								
Automatically sends newsletters in appropriate format:								
Plain text	■	■	■	■	■	■	■	■
HTML	■	■	■	■	■	■	■	■
AOL format	□	■	■	□	■	■	□	■
Subscribers can read/search newsletters via the Web	■	□	■	■	■	■	■	■
Service supports discussions	■	■	■	■	■	■	■	■
Subscribers can receive discussions in digest format	■	N/A	■	■	N/A	■	■	■
Subscribers can read/search discussions via the Web	■	N/A	■	■	N/A	■	■	■
Subscribers can post discussions via the Web	■	N/A	■	■	N/A	■	■	■
Subscribers can access content via news reader	□	■	■	□	■	■	□	■
Service supports attachments	■	■	■	■	■	■	■	■

RED denotes Editor's Choice. * Premium only. N/A—Not applicable: The product does not have this feature.

help pages and an FAQ document. A form lets users ask questions, but questions are not answered individually. In fact, there was no contact information other than an e-mail address on the site—not even a telephone number. If you use this service, you're bound to find yourself pretty much on your own.

All in all, ListBot lags behind the two most similar services (eGroups and Topica) in features. This isn't to say it's a bad service, but unless your needs are basic, you're likely to find that the other services offer you more for your efforts.

PostMaster General

\$20 per month (300 subscribers). MindShare Design Inc.; 888-634-2932, 408-975-9500; www.postmastergeneral.com. ●●●

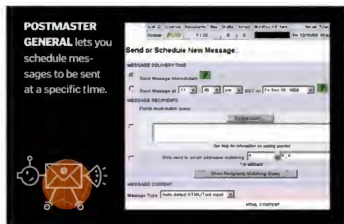
PostMaster General, a broadcast-only service from MindShare Design, is the only service we saw whose administration pages use SSL encryption—a comfort if you're concerned about list-data security. Other unique features include the ability

to reformat HTML messages automatically for AOL's quirky mail reader, to control which messages can be reviewed via a public archive page, to send test messages to preview mailings, and to upload and download databases in multiple formats.

One feature we especially appreciated was Web Site Integration—ready-made HTML for forms that subscribe and unsubscribe members, direct members to the list

archive, and let members search previously sent messages. Unfortunately, because PostMaster General doesn't incorporate demographic data, the only information that the pregenerated form asks of a prospective member is an e-mail address. One optional feature lets administrators require potential recipients to return a confirmation e-mail.

PostMaster General's friendly GUI interface uses pictures of stamps as buttons—and makes some silly visual puns. Administrators may find the artwork a hindrance rather than a help since it prevents the menu from being fully accessible without scrolling. PostMaster General charges for access to certain features



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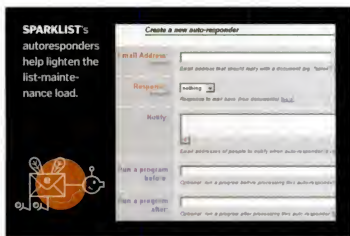
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as well as by volume and number of list members. A Pro membership lets you send attachments, use database fields as criteria to target recipients, and send HTML mail. Pro pricing starts at \$39.95 per month for a list with 300 recipients, Standard at \$19.95.

PostMaster General was sluggish during our tests. Administrative Web pages were slow to load. Of the two messages we mailed to nearly 10,000 dummy addresses on our own server, one had partially arrived after 8 hours, while the other had not started to arrive at all. PostMaster General claimed this was because we happened to test on an extremely busy day.

If security and a friendly interface are more important than tightly integrated demographic functions, you might consider PostMaster General. But we'd opt to do additional throughput testing before signing up.



SparkList

\$50 per month (50,000 messages). SparkList.com LLC, 888-772-7563, 920-450-5901; <http://sparklist.com>. ●●●●●



Though most services in this roundup were developed from scratch for the Web, SparkList is an exception. It runs on Lyris, a powerful, sophisticated list-maintenance software package developed independently of the Web. SparkList, which can be used to publish broadcast-only, moderated, and unmoderated discussion lists, adds a Web-interface front end to Lyris's software via Perl scripts.

SparkList is ideal for the power user; the service has a richness and depth of functionality that the completely Web-based

services cannot match. SparkList's Web stark front end is all business, compared with the graphics-intensive Web-based services. For busy administrators, however, this can be a plus. Most readers see the list only via e-mail, so they're unlikely to notice the site's lack of fancy trimmings.

SparkList doesn't track member demographics; if you want them, you have to collect and manage them yourself. This is the program's only major shortcoming, however.

SparkList offers autoresponders (which respond to incoming messages by forwarding documents or automatically running programs), an abundance of moderation and security options, and anti-spamming and anticrossposting provisions. SparkList also offers mail merging, automatic rejection of duplicate postings, "parent" and "child" lists, and access to the list via an NNTP news reader.

"Action phrases" trigger automatic responses, blocking spam and eliminating profanity from family-oriented lists. You can specify regular expressions—patterns of words and characters—and fixed phrases to watch out for.

SparkList acts as its own mailer rather than relying on a separate mailer such as Send-

mail, and thus keeps complete control of the process. This makes the service fast: Our test messages arrived almost instantly. Those with the technical know-how can easily extend Lyris by writing Perl script to add or customize functionality. Pricing is per member and by volume; you can also rent a colocated server.

SparkList doesn't provide the coddling and the gorgeous GUI many other services do, but its raw power may be just what you need for a large list, or for one to which you want to add specially coded features.

Topica

Free. Topica Inc.; 415-344-0800; www.topica.com. ●●●●●

Like eGroups and Microsoft bCentral's ListBot, Topica is a free, advertising-supported service that features broad-

cast, moderated, and unmoderated mailing lists. But unlike the other free services, Topica lets you opt out of all ads, except for a link to the Topica site that's at the bottom of each note, without charging a fee. Like eGroups, Topica also aims to be a portal for mailing lists. It contains an annotated directory of lists—even including some lists Topica does not host. Hits on the directory are a source of ad revenue. Finally, Topica is experimenting with offering selected list maintainers a piece of the action if they allow ads.

Topica offers a few features not shared by other basic Web-based mailing-list services. For example, subscribers can have their mail held while they're on vacation. Subscribers can also set up signatures that are automatically appended to messages composed via the Web. There's only one level of service, so all features are available without additional fees. As with eGroups, subscribers can read and participate exclusively via the Web, keeping their mailboxes uncluttered.

Noteworthy touches for list maintainers include control of how often digests are sent (every 10 messages or daily) and automatic approval or rejection of new subscribers by e-mail address. Imports are supported, though Topica must approve large additions. Subscription requests are confirmed to protect against list bombing, and bounces are handled automatically. Like other services, Topica can generate HTML to direct users to the list, archives, and so on from your Web page. During our testing the Back button didn't work on some of the list-management pages—an annoying glitch. And no demographic features were available—a minus for corporate or product-oriented lists.

Topica lacks the integrated groupware features of eGroups, such as file libraries, calendars, and chat rooms. It is possible, however, to schedule events via the Evite.com service. Topica and Evite.com are not directly connected, though, so comments posted at Evite.com won't get back to the mailing list.

Topica is a solid list service, but the most compelling reason to try it is to obtain a free list without ads. This might be important if, for example, your organization is nonprofit. Otherwise, you'll be better off with eGroups.

E-publishing works just as well for mom-and-pop shops as for giant corporations.



UnityMail Express

Setup fee, \$2,500; \$500 per month (20,000 messages). MessageMedia Inc.: 800-565-0198, 303-440-7550; www.messagemedia.com. ●●●●

UnityMail Express is MessageMedia's hosting service for UnityMail, its own mailing-list management software. UnityMail runs exclusively on Microsoft Windows NT and incorporates UnityPost, a specialized SMTP mailer, to avoid the overhead of Microsoft Exchange. Despite some rough edges, UnityMail incorporates some interesting features, such as campaign-style message delivery.

A Web-based interface lets you perform most administrative tasks remotely, and MessageMedia's friendly support staff can help with the rest. For example, when we

found that UnityMail couldn't import our test list of nearly 10,000 users in one gulp across the Internet, we e-mailed the file to tech support, and tech support imported it for us. Although there are no per-call or per-incident charges for support, UnityMail's fees are high: After \$2,500 for setup, you pay \$500 monthly for the first 20,000 messages.

UnityMail's menus are daunting because of the wealth of menu items and the unique terminology—a group of lists, for example, is called a *partition*. The online help wasn't complete; we received “404” errors and “under construction” messages. Fortunately, the UnityMail manuals are available online as PDF files.

Despite these rough edges, UnityMail offers all the powerful features found in

other list-management programs (such as Lyris and Listserv) plus a few unique ones. One of the most novel is the ability to create a series of messages called a *campaign*. Each message is sent, at a specified time or after a specified interval, to either an individual subscriber or the entire list. What's unique is that the starting time of the sequence can be different for different subscribers; for an education course, for example, subscribers could automatically receive lessons weekly starting on the date they were added to the list. MessageMedia recommends this feature for advertising or sales campaigns.

UnityMail fully supports autoresponders, trackable URLs, and demographics, as well as mail merges from SQL databases. Web-form generation, however, is not fully graphical; you'll need to know HTML and will likely need some hand-holding to get set up.

UnityMail has a richer graphical interface than the more powerful text-based ListPlex and SparkList and more power than friendlier Web-based systems such as PostMaster General and EnvoyMail. ■



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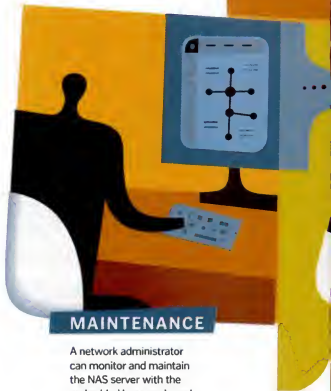
Stretch Your Storage

Adding a storage system to your network can save you space, time, and money.

BY LES FREED

The files we work with on our PCs have come a long way from the word processing documents of yesteryear, which could easily be stored on a floppy disk. Video, graphics, and archived data all take up valuable real estate on our cramped hard disks and servers. So if you want to expand the storage capacity of your business quickly—and ultimately reduce network traffic—consider adding a network-attached storage (NAS) server to your LAN.

These servers offer a rare computing combination: They're both affordable and easy to use, supplying an attractive and price-efficient alternative to buying new file servers or upgrading the hard disks in your existing server. We tested systems ranging in price from about \$30 per gigabyte of storage on the low, nonexpandable end to upwards



MAINTENANCE

A network administrator can monitor and maintain the NAS server with the embedded browser-based management software.

IN THIS REVIEW

- 151** HP SureStore HD Server 4000
- 151** Intel InBusiness Storage Station
- 152** Linksys Instant GigaDrive
- 151** Maxtor MaxAttach 72
- 154** NetGear Network Disk Drive ND520
- 162** NSS μ Stor 1U
- 166** Procom NetForce 100
- 166** Quantum Snap Server
- 168** SciNet Blazer
- 154** Scorecard
- 162** Performance Tests
- 167** Summary of Features

HOW NAS WORKS

NAS SERVER

These devices reside on the network, attached to either a traditional file server or a network hub. They are administered via browser-based management software.

A network-attached storage (NAS) server is a hassle-free way to add more hard disk space to your network.

ILLUSTRATION BY DOUG ROSS

BACKING UP

You can program your NAS server to back up specific directories or entire workstations automatically.

FILE EXCHANGE

NAS servers allow files to be exchanged among the attached client PCs.

of \$150 per gigabyte for systems with many of the same redundancy, reliability, and expandability features that midrange file servers provide.

So there really is a NAS solution for just about any budget. Best of all, you can install one of these devices in less than 30 minutes and manage it from anywhere via a Web browser.

WHO NEEDS ONE?

NAS servers are extremely flexible: You can use them as primary or secondary storage on your LAN, as shared backup devices for your small office or workgroup, or even as personal backup devices for individual clients. They operate somewhat slower than dedicated file servers, but they're much faster than tape drives.

Many small offices need to share files among several people. A NAS server lets them do so quickly and easily, without incur-

ring the installation and administrative costs associated with deploying a dedicated Windows NT or NetWare server. Although most NAS servers don't provide the same level of performance as dedicated file servers (see our benchmark test pages), they are more than fast enough for most small-office and departmental needs.

If you're faced with overflowing hard disks on your main file server, a NAS can provide some breathing room—without forcing you to take the main server down for maintenance. By moving archived or finished projects off the main server and onto the NAS server, you'll free up main disk space and reduce network traffic. Several of the products in our roundup support



MORE ON THE WEB: Be sure to visit the sites listed in Sitefinder for more information on network-attached storage. Also check out PC Magazine's Web site at www.pcmag.com.



Small workgroups: Quantum Snap Server Large workgroups: NSS μ Stor 1U

The nine NAS servers we tested all offer a good combination of features and performance. Two units distanced themselves from the pack, however. The Quantum Snap Server and the NSS μ Stor 1U are our Editors' Choices for small and large workgroups, respectively.

The Quantum Snap Server (\$1,800 street) has 40GB of capacity on two 20GB drives. For added security, the second drive can be configured with RAID 1 mirroring. As its name suggests, setup and administration are extremely simple. In addition, the device supports Mac, Microsoft Windows, NetWare, and Unix clients.

Larger workgroups and businesses usually count on fast performance to deal with large amounts of data. Fast read time and throughput are just what you get with the NSS μ Stor 1U, from Network Storage Solutions (\$6,000 street). The μ Stor performed on a par with an HP file server on our tests and easily bested the rest of the field. It is easy to install and configure, and its management software is among the best we saw.



Macintosh, Linux, and Unix clients—in addition to Windows PCs—cross-platform offices have a solution as well.

NAS servers also make excellent backup devices for individual clients on your network. Again, they're faster and more convenient to use than tape backup, and they provide instant access to files. The Intel InBusiness Storage Station includes Centered Systems' backup utility Second Copy 97, so users can automatically back up selected files from their hard disks to the NAS server. The LinkSys and NetGear products we reviewed provide Ethernet uplink switches, which let users attach their notebooks or desktop PCs directly to a NAS server without hubs or special cables, making it easy to drag and drop critical files from a PC to the server.

NAS servers operate much like standard file servers, but they don't require dedicated server PC or server OS licenses. Most use Pentium or StrongARM processors running proprietary server software. From the client's point of view, the NAS server looks and works exactly

like a file server, so no retraining or special software is needed. Users can browse servers and map drives on the network, just as they would with a Windows NT or NetWare server.

IN THIS ROUNDUP

For this roundup, we asked for turnkey NAS servers with 100-Mbps Ethernet connections targeting the workgroup/small-office marketplace. We set an upper price limit of \$6,000. Nine vendors—Hewlett-Packard, Intel, Linksys, Maxtor, NetGear, Network Storage Solutions, Procom, Quantum, and SciNet—had products that met our criteria and were shipping in time for the story. Another NAS server, which Unifore Technologies is developing in conjunction with Axis Systems, was still in beta, so we excluded it from this story. Yet another device that wasn't available for us to review but will be shipping by the time you read this is the Connex N3000, which will offer up to 90GB of storage.

The nine products in our roundup

cover a lot of ground, ranging from just \$650 to \$6,000, and from 29GB to 72GB of storage. Some—such as the Intel, Linksys, Maxtor, and NetGear products—are small boxes, not much bigger than Ethernet hubs. These lower-end products don't have room for expansion, but they provide exceptional value and surprisingly good performance. At the other end of the scale, the HP and Procom products offer high-reliability features like redundant power supplies and hot-swappable spare drives. Both the HP and Procom units provide easy storage expansion via cartridge-loading disk drives.

WHICH ONE?

Unless you need the high reliability and drive expansion features of the higher-end systems, you'll get a lot more storage for your money with one of the smaller, nonexpandable servers. The 20GB Linksys Instant GigaDrive—the least expensive product in the group—costs just \$33 per gigabyte, while the high-end systems from HP (\$5,800 list, 27GB capacity) and Procom (\$5,640 list, 36GB) weighed in at \$215 and \$156 per gigabyte, respectively.

Our contributors: **Les Freed** and **Bruce Brown** are contributing editors of PC Magazine. Associate editor **Jennifer Triviero** and PC Magazine Labs project leader **S. Jae Yang** were in charge of this story.

For a mixed-platform shop, choices are more limited. Only three of the products we reviewed (from Linksys, NSS, and Quantum) support non-Windows clients. The Quantum Snap Server was the only product to support Mac, Microsoft Windows, NetWare, and Unix clients.

In fact, the Quantum Snap Server's versatility, along with its excellent management tools, makes it an obvious Editors' Choice for smaller workgroups and offices. Our Editors' Choice for larger businesses—those that are concerned with high performance in both response time and throughput and have to deal with a large number of client PCs—is the NSS μ Store iU (\$6,000 street).

WHAT'S NEXT?

As PC prices fall, we expect to see NAS prices follow suit. Many of the components in NAS servers (CPUs, RAM, and especially hard disks) are off-the-shelf PC components, so the same forces that are driving PC prices down should affect the NAS market as well. With International Data Corp. (IDC) predicting a huge 54 percent growth per year in the NAS market through 2003, it's a safe bet that we'll soon see devices with pricing and configurations to fit almost every office's needs.

ALL REVIEWS BY LES FRIED

HP SureStore HD Server 4000

27GB, \$5,800 list. Palo Alto, CA: 800-752-0900; www.hp.com/storage. ●●●

HP is a major force in the RAID subsystem and tape storage markets, and the HP SureStore HD Server 4000 (\$5,800 with three 9GB disks) marries the two technologies into one attractive, easy-to-manage NAS. The SureStore combines up to six disks—up to 18GB each—with a 40GB DAT backup system in a single mini-tower chassis.

The SureStore had the second-best scores on our NetBench tests, but at \$215 per gigabyte, it's by far the most expensive product in our roundup. The cost, as well as the additional features and expandability, makes it most appropriate for relatively large businesses. The SureStore is a strong contender, lacking only some of the reporting features and sacrificing only some of the performance of our Editors' Choice, the NSS μ Store iU.

Part of the extra cost is due to the Sure-

Store's excellent data and power redundancy features. The unit's cabinet includes redundant, hot-swappable power supplies and houses six SCSI drive array slots. A slot above the drive array provides space for a field-installable 24GB or 40GB DAT drive (which came already installed on the model we tested), and a rear-panel SCSI serial connector lets you connect one or more external DAT drives. The SureStore also provides UPS monitoring via a serial port; attach your UPS to the NAS and you'll be able to view its status and other diagnostic information.

Our test unit was equipped with three 9GB Ultra Fast/Wide SCSI disks. The disks operate in RAID 5 mode, so the 27GB of raw disk space yields about 18GB of usable storage. You can add a fourth disk as a hot spare, or you can fill out the array with additional 9GB or 18GB disks. If you need even more storage, you can order the SureStore with six 18GB disks for \$7,120 (list), bringing the cost down to about \$66 per gigabyte.

Installation is simple, thanks to a front-panel LCD and intuitively designed buttons. When you start the SureStore for the first time, it attempts to obtain an IP address via a DHCP server. If none is found, the unit prompts you to enter an IP address using the front-panel buttons. Once this address is set, HP's excellent browser-based configuration wizard helps you complete the installation and perform ongoing maintenance via the browser.

The SureStore has some of the most thorough security and user management features of any product we tested—right up there with those of NSS and Procom. The management interface is password-protected to prevent unauthorized access, and the drive bays and system cabinet include key locks to prevent drive theft or tampering. The SureStore's built-in user database lets the system administrator control access on a user or shared



basin, and user authentication requests can be referred to a Windows NT domain server if one is available.

Like most HP network products, the SureStore can be remotely managed and monitored using HP's management suites OpenView and TopTools. The SureStore maintains a browser-accessible event log, but it doesn't keep track of disk usage or network traffic. Its processor is a 300-MHz RISC chip with 128MB of RAM, and the system's operating software resides in 32MB of flash ROM. You can update the firmware via the browser interface by downloading the latest version from HP's Web site.

We were disappointed by the SureStore's lack of Macintosh and Unix client support. But take heart: Hewlett-Packard recently added Mac support to its SureStore network tape drives and is planning to introduce Mac support into the SureStore in a future update.

Intel InBusiness Storage Station, Maxtor MaxAttach 72

InBusiness: 24GB, \$1,200 street. Hillsboro, OR: 800-538-3373; www.intel.com/network. ●●●
MaxAttach: 72GB, \$2,000 street. Milpitas, CA: 800-262-9867; www.maxtor.com/maxattach. ●●●

Twins, separated at birth? Almost. The Intel InBusiness Storage Station and the Maxtor MaxAttach 72 share a common hardware platform and have similar GUIs, but they have vastly different disk capacities and are sold through different channels. Both products provide excellent performance and value; either would be a good choice for a small business looking for an easy way to add storage to its LAN.

Intel offers the InBusiness in 12GB and 24GB versions, while the MaxAttach comes in 18GB, 36GB, and 72GB models. The major difference between the Intel and Maxtor products lies in the hard disks: Intel's 24GB model has two 12GB Western Digital EIDE disks; the most capacious MaxAttach has two 36GB Maxtor hard disks.

We tested the 24GB InBusiness and the 36GB MaxAttach. The Intel and Maxtor products turned in very similar performance results, with the Maxtor having a slight edge on all our test runs. Both finished in the middle of the pack, holding their own against systems that cost nearly twice as much.

By the time you read this, though, Maxtor will have made a change in its product line offering. Instead of the 18GB, 36GB, and 72GB models, the MaxAttach will be available in configurations of 20GB, 40GB, and 80GB. The newer models will be using higher-density disks, up from 9.1GB to 10.2GB per platter. And the 40GB version (replacing the 36GB model) will consist of two 20GB disks, which means it will have the same mirroring capabilities as its larger sibling.

Apart from the disks, both products share an identical 266-MHz Pentium MMX-based hardware platform with 32MB of RAM and very similar cosmetics. The front panel has four status LEDs, showing power, LAN, and disk activity, but there are no disk utilization LEDs as on similar products from Linksys and NetGear. The rear panel hosts a 10/100 Ethernet connection, but neither product provides an MDI switch to allow direct connection to a client PC. Both use an external power supply and have a rear-panel on/off switch.

Installation is similar for the two products. A companion CD-ROM contains a simple setup wizard that prompts you to set your unit's clock and select an administrator password. The setup wizard then attempts to locate a DHCP server on the LAN; if none is found, it prompts you to enter an IP



address for the server. After a reboot, the server is ready to use; further administration is done through an attractive, well-organized browser interface. The Intel version of the interface offers fewer menu choices and is slightly simpler to operate than that of the MaxAttach, but both provide nearly identical functionality.

Both the Intel and Maxtor products can authenticate users via a Windows NT domain server, making them good choices for organizations that use domain security. If you don't have a Windows NT

server on the LAN, you can use the browser interface to enter user names and passwords. Once you've configured the server, you can make a backup copy of the configuration file (including user names and passwords) onto the server's hard disk. A built-in scheduler lets you automatically back up the configuration data as often as you like.

Maxtor's product is designed for the corporate and VAR markets, where it's assumed that an experienced technician will install the product.

Intel's version of the product is focused on the small-office marketplace, so the company includes some programs that make the NAS unit easier to use, like an automatic client drive-mapping utility. Intel also bundles backup software called Second Copy 97 with its server; this software automatically copies a PC's entire hard disk onto the server with little or no user intervention.



THE GIGADRIVE includes Macintosh support and a built-in print server—a combination not found in any of the other products we tested.

Linksys Instant GigaDrive

20GB, \$650 street. Irvine, CA; 800-546-5797; www.linksys.com. ●●●

Priced at only \$650 (street), the Linksys Instant GigaDrive is the least expensive product in our roundup. But the diminutive



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price is deceptive, because the GigaDrive includes Macintosh support—as does the Quantum Snap Server—and a built-in print server, a combination of features not found in any of the other products we tested. You might expect such a low-cost device to finish at the bottom of the pack with regard to performance, but the GigaDrive held its own with products that cost twice as much.

Linksys—like NetGear—caters to the small-office and home networking markets. Most small businesses don't have dedicated IT persons on staff, so ease of installation and ease of use are number-one priorities. Like the NetGear Network Disk Drive ND520, the GigaDrive is exceptionally easy to install and configure. But the GigaDrive offers security and disk quota management features that the NetGear unit doesn't supply, making it a better choice for small offices and departments where security is a concern.

Network Disk Drive Settings

Name

Workgroup

Admin Email

Time

Month Day Year

Hour Min ☐ AM ☐ PM

The GigaDrive is housed in an attractive purple plastic cabinet that can stand on its side or horizontally. The front panel displays a full set of status lights, including a set of disk usage LEDs that show at a glance how full the disk is. The rear panel hosts an RJ-45 Ethernet connector with an MDI switch, letting you connect

THE NETGEAR management interface is simple and clear, and it can be password-protected to prevent unauthorized access.



the GigaDrive to a hub or a PC. A parallel-port connector makes a surprise appearance. And the GigaDrive's built-in print server lets you share any parallel printer on the LAN, which gives you one more location to attach a network printer.

Linksys acknowledges the upward trend in the Mac market by including excellent Macintosh support in the GigaDrive. Macs and PCs on the same LAN cannot exchange files directly with one another, but they can access files stored on a server. The GigaDrive provides AppleTalk support so that Mac clients can access files stored on shared disks. This is especially appealing for offices that use Macs for graphic design and page layout, since it provides a convenient way to move files between Macs and PCs without resorting to removable media like Iomega Zip or Jaz drives.

Because it is affordable, performs admirably, and offers a host of features, small offices—especially those with a mix of Macs and PCs—would be well served by the Linksys Instant GigaDrive.

NetGear Network Disk Drive ND520

20GB, \$800 street. Santa Clara, CA: 888-638-4327; www.netgearinc.com. ●●●

The NetGear Network Disk Drive ND520—like the rest of NetGear's product line—targets the small-business market, where simplicity of setup and ease of administration are major buying factors. And though the ND520 delivers, its performance lagged most of the other products on our tests, including competitive-



SCORECARD

For our **deployment and installation** rating, we look at what's involved in setting up each unit. Can an administrator preconfigure the device and send it to a branch office for quick installation? **Administration and configuration** includes tuning the device for security, adjusting access restrictions, and monitoring for usage and disk-capacity statistics. Also measured for this rating is the ease of use of the management interface. To judge **interoperability**, we take into account what servers a device emulates and what protocols it supports. The **performance** rating is based on a device's throughput and average response time.

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RED denotes Editor's Choice.

	Deployment and Installation	Administration and Configuration	Interoperability	Performance	OVERALL
HP SureStore HD Server 4000	●●●●●	●●●	●●	●●●	●●●
Intel InBusiness Storage Station	●●●●●	●●●	●●	●●●	●●●
Linksys Instant GigaDrive	●●●	●●●	●●●	●●	●●●
Maxtor MaxAttach 72	●●●●●	●●●	●●●	●●●	●●●
NetGear Network Disk Drive ND520	●●●	●●●●●	●●●	●●	●●●
NSS µStor 1U	●●●●●	●●●	●●●	●●●●●	●●●●●
Procom NetForce 100	●●●●●	●●●●●	●●	●●●	●●●●●
Quantum Snap Server	●●●●●	●●●●●	●●●●●	●●●	●●●●●
SciNet Blazer	●●●	●●●	●●	●●●	●●●

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ly priced units from Intel and Linksys. The good news is that its benchmark test scores may not matter. NetGear markets the ND520 primarily as a backup device for laptops and file servers, and its throughput speed is more than adequate for the intended uses.

The \$800 ND520 (20GB)—like its smaller sibling, the \$560 ND508 (8GB)—provides storage in a small, unobtrusive box that you can quickly install anywhere on your LAN. Unlike most of the smaller servers in our tested group, the 20GB ND520 has a built-in power supply instead of a bulky external transformer.

The ND520's front panel contains a single RJ-45 Ethernet connector with speed, activity, and link LEDs, and an uplink switch for attaching either a PC or a network hub. Another row of LEDs shows disk utilization at a glance, and a rear-panel on/off switch performs an orderly shutdown of the system (rather than just cutting off the power).

NetGear provides a simple foldout installation poster; you can find a more complete manual on the CD-ROM, but you're not likely to need either one. Installation is a simple matter of plugging in the



THE µSTOR interface provides status reporting, including charts and graphs of network and disk usage and system log information.



power cord and a network cable. If your network is equipped with a DHCP server, you're finished. If your network does not have a DHCP server, you'll need to install and run a utility program on the provided CD-ROM to set the ND520's IP address. When you're done, you can use a browser

to manage the user access list. By default, all users have access to the entire shared disk, but you can limit access on a directory basis. The management interface is simple and clear, and it can be password-protected to prevent unauthorized access or changes.

In addition to the manual and the IP configuration program, NetGear's CD-ROM contains a handy tool that locates all the NetGear servers on a LAN and automatically maps a drive letter to each one. This is a much appreciated addition that lets

everyone in your office access the ND520 with just a double click.

If speed is not your small office's primary concern, NetGear offers a reliable, easy-to-use storage solution, though the Linksys unit offers better performance at a cheaper price.

Ricoh eCabinet

Look to the near future and you'll see a new class of information management and storage solutions for small businesses and departmental workgroups from Ricoh Silicon Valley (877-580-3030; www.rsv.ricoh.com). The Ricoh eCabinet, scheduled to ship in April and sell for about

\$14,000, is a network appliance designed to capture, organize, store, and retrieve a wide variety of document types, including e-mails, faxes, copies, scanned images, computer files, and Web pages. When attached to a network via a 100-Mbps

network clients running Windows 95, 98, or NT. We saw a late beta version of the eCabinet but did not test the device.

Setting up the eCabinet to work with various devices is done using a browser-based interface. According to Ricoh, you'll be able to configure the eCabinet easily, and that includes identifying and configuring devices such as printers, copiers, and fax machines, as well as setting security levels.

Every time the eCabinet stores a document, it makes an entry in a directory on the hard disk; simultaneously, it writes copies of the document and the directory entry to a rewritable DVD. When one DVD-RAM disk is full, the eCabinet automatically ejects the current disk, and its LCD status screen prompts you to insert another one. As the hard disk fills, documents that are accessed less frequently are automatically stored on a DVD-RAM. For more internal storage, you can install a second IDE hard disk in a provided bay.

For further levels of protection, the eCabinet's software also supports backing up to RAID systems and DVD jukeboxes for off-site storage. According to Ricoh, once documents have been written to DVD-RAM disks, recovering from a disaster or reanimating less used documents is a simple matter of pointing to a directory and inserting the proper DVD, as identified by the eCabinet. If the eCabinet ships and works as promised, its high level of integration, ease of operation, and unlimited virtual capacity will offer an attractive alternative to network-attached storage.—Bruce Brown



Fast Ethernet connection, the eCabinet stores all documents both on an internal hard disk and on DVD-RAM disks.

Roughly resembling a VCR or DVD player, the 7.0-by-15.5-by-12.2-inch eCabinet is powered by a 400-MHz Intel Celeron CPU with 256MB of RAM, a 17.2GB IDE hard disk, and a DVD-RAM drive (CPU speed and hard disk capacity may be increased by the shipping date). Its OS—FreeBSD 3.3 Unix—works with

NSS μ Stor iU

9GB, \$6,000 street. Chantilly, VA; 800-532-2224;
www.nssolutions.com. ●●●●

The \$6,000 NSS μ Stor (pronounced "microstore") iU combines off-the-shelf hardware, a clever custom cabinet, and proprietary software for a flexible, high-performance NAS product. The μ Stor is easy to set up and configure, and its per-

formance was impressive—on a par with that of the Windows NT server we tested for comparison. It easily bested the field on our benchmark tests; coupled with its management and security features, that makes the μ Stor an obvious Editors' Choice.

NSS specializes in NAS devices for the booming ISP marketplace, where the company's products are used to provide



Web and FTP storage space for ISP hosting clients. Although it is the most expensive product in our review group, the μ Stor is the smallest server in the company's product line. The iU in its name refers to the fact that it occupies only one rack unit (1.8 inches) of vertical space when it is installed in a standard 19-inch equipment rack.

BENCHMARK TESTS

Network-Attached Storage



There is much more to a network-attached storage system than just performance. But if high performance in both throughput and response time is a requirement, the NSS μ Stor iU is the only choice in our roundup to offer speed comparable to that of a typical workgroup file server like the HP NetServer E 60.

Network-attached storage (NAS) systems are designed primarily to provide the functionality of file servers. As performance needs may vary, depending on your network environment and size, the data we report here must be viewed in the proper context. To ascertain each NAS system's ability to deliver the performance level required for its role, we tested each system with ZD NetBench 6.0. This test program measures the server's ability to handle file input and output (I/O).

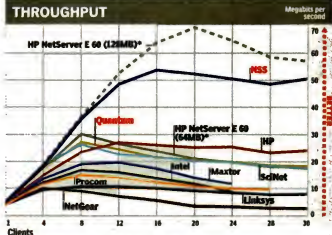
NetBench 6.0 is highly network-bound and exercises the hard disk subsystem heavily. The hard disk subsystem's performance depends on the amount of main system memory used for drive caching. As none of the NAS systems in the roundup are designed to support large numbers of users, we varied the number of clients on our test network from 1 to 30 only.

NetBench produces data that can be constructed into scalability curves. Each data point on the first chart represents the total throughput (in megabits per second) that the server achieved with a specific number of clients attached. The later the curve peaks, the more clients the NAS system can support effectively. Initially, the throughput increases with the number of clients until the server's limited I/O bandwidth is completely inundated with requests. Beyond this point, adding more clients only increases the system overhead, so total throughput decreases. We also plotted a scalability curve that shows the average response time. This graph illustrates the user experience at each client load level. We report the results that an HP NetServer E 60 achieved with 64MB and with 128MB of RAM for comparison.

The fastest NAS is not always the best choice for your network. Because NetBench 6.0 is a stress test program, the number of clients on our test network does not directly represent the size of a network in a real work environment. In real life, not everyone on the network is accessing the

server constantly at the same time. Our 4-client-load level, where 4 client systems are constantly interacting with the NAS, roughly simulates a moderately active 20-client network or a lightly active 40-client network. If you are looking for a NAS to support a small workgroup's file-serving needs, any NAS we reviewed may be fast enough. Case in point: With 4 clients attached to the network, the difference in response time between the slowest NAS (the NetGear) and the fastest (the NSS) was only 3 milliseconds. But if your workgroup consists of users who actively upload and download large files, like graphics designers, then a NAS with a higher throughput is desirable.

You also have to consider the projected growth of your workgroup. You'll want a NAS with throughput performance



ED denotes Editors' Choice. * Reported for comparison. The Intel, Maxtor, and Procom units are designed for smaller workgroups. We tested the Intel and Maxtor with up to 24 clients and the Procom with up to 28 clients.

A Scalability curves: Each data point on the first chart represents the total throughput (in megabits per second) that the server achieved with a specific number of clients attached. With up to four clients active, the Quantum Snap Server and SciNet Blazer were almost as good as the NSS μ Stor iU in terms of total throughput. For a

small network, this means the two products are nearly equivalent to the NSS unit. Watch where the curves peak, however; the NSS clearly distinguishes itself with a larger client load. The later peak of the unit indicates that it has the potential to support a large-scale network, such as an ISP or Web-hosting service.

The μ Stor is essentially a dedicated high-performance PC running NSS's proprietary multitasking server OS. It consists of an Intel 440GX motherboard, a 500-MHz Pentium III CPU, and 256MB of RAM, packed into a large (19- by 23-inch) pizza-box enclosure. The unit includes an Intel 10/100 Ethernet adapter and an Adaptec 7896 Ultra-2 SCSI controller and is available with capacities of

9GB to 36GB. We tested the 9GB model.

The μ Stor's rear panel provides connectors for an external SCSI device, an Ethernet adapter, and an optional keyboard and monitor. The front panel hosts a 3.5-inch floppy disk drive, a CD-ROM drive, and slots for two hot-swappable SCSI hard disks. The external SCSI interface can connect to virtually any external SCSI storage device,

including tape drives and RAID arrays.

Installation is simple, especially if you connect a keyboard and monitor for the initial setup. A simple configuration menu walks you through the process of setting the unit's IP address and workgroup name; once you've completed these basic steps, you can access the μ Stor's Web interface from any browser. If you don't want to connect a monitor

that peaks at a higher client load if you expect your workgroup to grow. If the workgroup grows no larger than 40 to 80 people, users will experience little difference between the Quantum Snap Server and the NSS μ Stor iU. But if your workgroup doubles, the μ Stor may respond four times as fast as and yield more than twice the throughput of the Snap Server. An ISP that has to add more storage to its Web server needs a NAS that can maintain a low response time and high throughput with many clients on the network.

True to the vendor's claim, the NSS μ Stor iU demonstrated its ability to act as added storage for a demanding environment, like an ISP's Web server cluster, by producing high throughput and fast response time at high-client-load levels. The μ Stor was the only NAS comparable in performance to the HP NetServer E 60, a Windows NT file server. The HP SureStore HD Server 4000, Quantum Snap Server, and SciNet Blazer had almost identical performance, nearly as suitable for

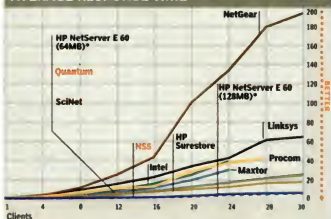
serving a small to midsized workgroup (up to 80 users) as the μ Stor. Though high-priced, the Procom NetForce 100 turned in disappointing performance, even lower than that of the lower-priced Intel InBusiness Server Station and the Maxtor MaxAttach 72. The Intel and Maxtor entries have almost identical hardware, and their performance would be adequate for a small workgroup; however, they were clearly outperformed by the Quantum Snap Server, which targets the same market. The Linksys Instant GigaDrive and the NetGear Network Disk Drive ND520 are aimed at users who want an instant storage solution for a very small network (fewer than 10 clients), and their benchmark test results confirmed the target market.—*Analysis written by S. Jae Yang. Special thanks to Aaron Martinez of ZD Labs.*

HOW WE TESTED

Each NAS system was attached to a network consisting of 16 Pentium/200-based Dell Dimension XPS 200N clients, eight Pentium/166-based Dell Dimension XPS Pr66 clients, and six Pentium II/266-based Dell OptiPlex GX4 clients. All 30 clients were running Windows NT Workstation 4.0 (with Service Pack 4) and had Intel PRO/100+ Fast Ethernet adapters. The 31-node network (with 30 clients and one NAS) was physically connected through an Extreme Networks Summit 48 Fast Ethernet switch. The NAS system was attached to the network via TCP/IP, or via SMB if it did not support TCP/IP.

On each NAS system, we ran the Standard Mix from ZD NetBench 6.0, modified to run on a 30-client network. NetBench 6.0 evaluates a server's ability to handle file I/O requests from clients. Although NetBench is a synthetic test program, it profiles the workload on the server caused by actual applications running on the clients. We used the Standard Mix test suite, which runs with 1 client, then 4, and increases the load in multiples of 4 thereafter; we modified the suite to stop at 30 clients. The active clients engage the server with requests for network file operations. During the test runs, each client records the amount of data exchanged with the server as well as the elapsed time. With these pieces of data, the client calculates the throughput at each client load level. At the end, the NetBench program adds all the throughput scores that the active clients reported, thus calculating the total throughput for each level of client load. The program also reports the average response time at each client load level.

AVERAGE RESPONSE TIME



RTD: desktop Editors' Choice. * Reported for comparison. The Intel, Maxtor, and Procom units are designed for smaller workgroups. We tested the Intel and Maxtor with up to 24 clients and the Procom with up to 26 clients.

Timing isn't everything: This graph illustrates the user experience at each client load level. In the average small-business office, documents that reside on the network are primarily small files. When there were only a handful of clients accessing the server, all the entries turned out fast response times. As the client load level

increased, devices such as the HP SureStore HD Server 4000, the NSS μ Stor iU, and the SciNet Blazer stood out for consistent fast responses. But if you have to deal with very large files, like graphics or digital videos, throughput becomes a much more important factor to consider—even with just a few clients loaded.

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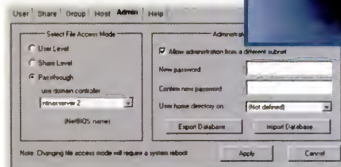
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and keyboard, you can use any text editor to edit a file on the μ Stor's boot disk and then start the system from a floppy disk.

The browser interface uses a tree-like menu system on the left side of the screen, making it easy to locate any item on the menu. This interface provides the best real-time status reporting of any of the products we tested, including real-time charts and graphs of network and disk usage, device status, and system log information. If you leave a monitor attached to the μ Stor, you can view text-based real-time disk and network traffic status, along with color-coded alert and



THE NETFORCE has some of the best e-mail and pager notification alerts of any product in this roundup.

alarm messages. The monitor and keyboard provide a second, text-based administration and configuration console for the system, using the μ Stor's built-in menu system.

The μ Stor was originally designed as an NFS file server for the Unix marketplace, and NSS recently added SMB support to let the μ Stor operate in a Windows environment. Though it can authenticate users on a Windows NT domain server, the μ Stor maintains its own list of file and directory rights. This arrangement allows security-conscious users to work with the μ Stor's own user-rights database rather than relying on an external Windows NT server for authentication. Unfortunately, doing so currently requires you to maintain a separate user database on the μ Stor. NSS plans to improve Windows NT security integration in a future release.

The μ Stor offers excellent performance and the flexibility needed in a high-traffic office.

Procom NetForce 100

36GB, \$5,640 list. Santa Ana, CA; 800-800-8600; www.procom.com.

Every now and then we run across a product that we really, really want to like. The Procom NetForce 100 is one of those. It's

attractive, built like a tank, and very easy to install, use, and administer. Unfortunately, the NetForce's relatively high price coupled with its mediocre performance dampened our enthusiasm.

The NetForce, an industrial-strength NAS, has many of the same high-end features found in the higher-end units from HP and Network Storage Solutions, like hot-swappable RAID 5 disks, redundant power supplies, and hot-swappable fans. But you'll pay big bucks for these features. The NetForce costs about \$156 per gigabyte—more than three times the cost of the Maxtor MaxAttach 72, a product that easily outperformed the NetForce on our tests. But to be fair, the NetForce's RAID array provides the best data redundancy and reliability features in the roundup.

Housed in an attractive, beautifully finished black mini-tower chassis, the NetForce has an illuminated LCD panel, a set of status lights, and a set of buttons on the front panel. Six lockable drive bays provide up to 36GB of storage using RAID 5. We tested the NetForce with its maximum 36GB capacity. The rear panel contains two redundant hot-swappable power supplies and four hot-swappable fans, as well as 10/100 Ethernet and external SCSI connectors.

Like many of the products we reviewed, the NetForce can obtain an IP address via DHCP if that's available, or you can enter the IP address manually using the LCD and buttons. Once you've entered the address, the NetForce is ready for use, or you can perform additional configuration via the browser interface. We had our NetForce up and running in less than 10 minutes, including the time it took to set the IP address and reboot the system. The attractive browser interface includes a quick-start setup wizard that walks you through the unit's first-time installation.

Ongoing maintenance and administration tasks are also performed through the browser interface, with one glaring exception: You can manage the RAID array only through a clunky text-mode telnet interface.

On the plus side, the NetForce has built-in support for managing a tape drive (if you attach one to the SCSI port), including scheduled, unattended backups, which means you can archive your disk array on tape. The NetForce also has some of the best e-mail and pager notification alerts of any of the products we tested, on a par with those of the Intel and NSS units.

The NetForce has some attractive features—like the hot-swappable drives and the RAID protection, though we would like to see better performance out of a device that targets a relatively high-end user.

Quantum Snap Server

40GB, \$1,800 street. San Jose, CA; 888-343-7627; www.snapserver.com.



The 40GB Quantum Snap Server provides abundant storage for its price, RAID data protection, and excellent cross-platform support in a compact, easy-to-manage package. The Snap Server also outperformed the other sub-\$2,000 products in our roundup, but it costs about the same per gigabyte. Its combination of price, performance, and management features makes the Snap Server the Editors' Choice for small workgroups.

Quantum offers two models of the Snap Server. The 20GB model lists for \$999. We tested the larger 40GB version; it contains two 20GB hard disks, which

SUMMARY OF FEATURES

Network-Attached Storage

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	HP SureStore HD Server 400	Intel Business Storage Station	Linksys Instant CloudDrive	Maxtor MaxAttach 72	NetGear Network Disk Drive NDC36	HSS µStor	Procom NetForce 100	Quantum Snap Server	SciNet Blazer
■ YES ■ NO									
Embedded administrative software version	N/A	1	1	1.5	1.2	3.3.0	20 H	2.1	1.05
Price of tested unit	\$5,800 list	\$1,200 street	\$650 street	\$2,000 street	\$800 street	\$6,000 street	\$5,640 list	\$1,800 street	\$1,195 list
Capacity (unformatted)	270GB	24GB	20GB	72GB	20GB	9GB	36GB	40GB	20GB
Maximum capacity	108GB	24GB	20GB	72GB	20GB	36GB	36GB	40GB	80GB
Chassis dimensions (as tested, in inches)	16.8 x 8.5 x 17.5	2.5 x 9.0 x 11.0	3.0 x 8.0 x 11.0	2.5 x 11.0 x 9.0	13.0 x 1.7 x 10.5	1.8 x 19.0 x 23.0	13.0 x 6.5 x 12.0	15.0 x 9.0 x 4.0	14.0 x 8.0 x 19.0
Available as rack-mounted/desktop unit	■ ■	□ ■	□ ■	□ ■	■ ■	■ □	■ ■	□ ■	□ ■
Number of disk drives in tested unit	3	2	1	2	1	1	6	2	1
Maximum disk drives available	3	2	1	2	1	1	6	2	4
Hard disk manufacturer and type	Proprietary SCSI-2	Western Digital EIDE ATA/33	Seagate IDE	Maxtor UltraATA/33	IBM EIDE	IBM SCSI	IBM IDE	Quantum UltraATA/66	Maxtor IDE
Mean time between failures (hours)	Info not available	63,279	40,000	Info not available	50,000	Info not available	500,000	250,000	26,280
Processor	32-bit RISC/300	Pentium MMX/266	Cyrix GXm-266GP/200	Pentium/266	Cyrix MII/266	Pentium III/500	10T/200	Pentium/133	AMD K6/400
Operating system	VX Works	FreeBSD	Linux	MaxOS (BSD-based)	Linux	Spansor Real Time Kernel	Proprietary	Embedded Unix derivative	Linux
Amount of RAM	32MB	32MB	32MB	32MB	16MB	256MB	32MB	64MB	64MB
SECURITY									
Access control lists (read, write, and full access)	□	■	■	□	□	■	□	□	■
Administrator can create users and groups	□	■	■	■	□	■	■	■	■
Restrict access to drives and directories based on user or group name	■	■	■	■	□	■	■	■	■
Implement file-level restrictions	□	□	□	□	□	□	□	□	□
Integrate with a Windows NT domain	■	■	■	■	■	■	■	■	□
Integrate with a NetWare NDS tree	□	□	□	□	□	□	□	□	□
Set disk quotas	□	□	□	□	□	□	□	□	□
Set time restrictions	□	□	■	□	□	□	□	□	□
MANAGEMENT									
Browser-based management	■	■	■	■	■	■	■	■	■
Proprietary management utility	■	■	■	■	■	■	■	■	■
SNMP	■	■	■	□	□	□	■	□	□
NOTIFICATION AND LOGGING									
Notifies the administrator of a problem	■	■	■	■	■	■	■	■	□
Means of notification	E-mail, SNMP trap	E-mail, HTML alert, LED alert	E-mail	E-mail	Audio alarm, E-mail	Page (requires external modem)	E-mail, LED alert	E-mail	N/A
Product keeps a log	■	■	■	■	□	■	■	■	■
REPORTING									
User can view network usage statistics	□	□	□	□	□	■	■	□	■
User can view disk usage statistics	□	■	■	□	■	■	■	■	□
SERVER TYPES EMULATED									
NetWare	□	□	□	□	■	□	□	■	□
Microsoft Windows	■	■	■	■	■	■	■	■	■
Mac OS	□	□	□	□	■	□	□	■	□
Unix/NFS	□	□	□	□	■	□	□	■	□
Network protocols supported	IP	IP	AppleTalk, IP	IP	IP, IPX, NetBEUI	IP	IP	AppleTalk, IP, IPX, NetBEUI, NFS	IP
RESILIENCY									
RAID options	Level 5	None	None	None	None	None	Levels 0, 1, 5	Levels 0, 1	None
Hot-swappable disk drives	■	■	□	□	■	■	■	□	■
Redundant disk drives	■	■	□	□	□	□	■	□	□
Hot-swappable power supplies	■	□	□	□	□	□	■	□	□
Redundant power supplies	■	■	□	□	□	■	■	□	□
SUPPORT									
Warranty	1 year on-site service	3 years	2 years	3 years	3 years	1 year	3 years	3 years	1 year

RED denotes Editors' Choice.

N/A—Not applicable: The product does not have this feature.

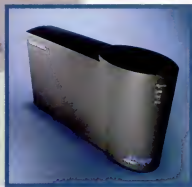
you can configure to operate as one large drive (using RAID 0), two separate 20GB drives, or a single 20GB drive with RAID 1 mirroring for extra reliability.

The Snap Server is housed in an attractive plastic cabinet with four status LEDs on the front panel; the power and Ethernet connectors are on the back. A recessed rear-panel button lets you selectively reset the unit's IP address, administrator password, or network settings, a feature we found convenient when we moved the Snap Server from one test network to another. Installation is simple, using either the Macintosh or Windows version of the configuration program SnapAssist (both versions are provided on a CD-ROM). Once you've performed the initial configuration with SnapAssist, you can configure and manage the Snap Server from any Web browser, using the unit's excellent browser interface.

We found the Snap Server's cross-platform connectivity to be the best among all the products we tested. The Snap Server supports Windows, Unix, and Macintosh clients, using the TCP/IP, IPX, NetBEUI, and AppleTalk protocols. The unit can authenticate users internally via a NetWare Bindery server or a Windows NT domain controller.



THE SNAP SERVER
can be configured and managed from any Web browser, using the unit's excellent browser interface.



can see important error conditions at a glance. E-mail notification of system failures or problems is provided for up to two users.

Workgroups and small businesses—especially cross-platform environments—won't find a better storage solution than the Quantum Snap Server.

SciNet Blazer

20GB, \$1195 list. Sunnyvale, CA: 800-653-1010; www.scinetcorp.com. ●●●

At first glance, the SciNet Blazer resembles the Procom NetForce 100: Both have a mini-tower chassis, front-panel LCDs, and removable drive bays. But

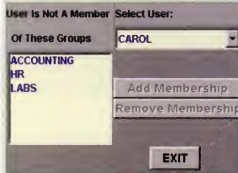
SciNet's designers opted to use as many off-the-shelf components as possible to keep the costs down. As a result, the 80GB Blazer lists for only \$2,495, and the 20GB model we tested lists for just \$1,195. Despite these low prices, the Blazer turned in respectable scores on our benchmark tests.

The Blazer has a standard PC mini-tower chassis and uses an off-the-shelf motherboard powered by a 400-MHz AMD K6-2 CPU and 64MB of RAM. One expansion slot is used by a Fast PCI Ethernet card, but there's no graphics card in the system. The topmost drive bay contains an LCD panel that displays status and configuration information; two additional drive bays hold slide-out trays with key locks. The test unit SciNet provided for our review had a single 20GB drive. An additional hard disk mounted inside the chassis stores system boot and configuration data, so you can replace both of the removable hard disks without having to reinstall the Blazer's operating software.

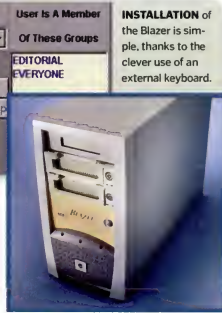
Installation is simple, thanks to the Blazer's clever use of an external keyboard for entering configuration data. When you first power up the system, you can enter several keystroke combinations to set basic system configuration parameters; for example, pressing Ctrl-Alt-1 lets you enter a new IP address. Once you've configured the Blazer, you can disconnect the keyboard or leave it connected to perform basic management tasks, such as shutting down the system.

The Blazer's browser-based interface is straightforward and easy to understand. Since the Blazer lets users view a directory of files on the server using any Web browser, they don't even have to map a drive to the server to view its directory. The browser interface lets administrators control file access for both users and groups.

If cost is a factor, you should consider the Blazer. Very much like the Intel In-Business Storage Station, it is not a top performer, but it represents a good mix of features and value.



The Snap Server's browser interface is excellent, and an extensive help system provides detailed help for every screen—a feature lacking in most of the products we tested. The Web browser also provides access to the unit's color-coded event log. Critical errors display in red and warnings in yellow, so you



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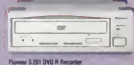
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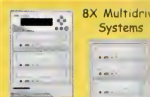
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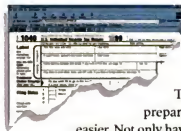
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THE PERSONAL SIDE OF TECHNOLOGY



Computing Your Taxes

BY KATHY YAKAL



If you've had a hard time in the past few years choosing between Block Financial Corp.'s Kiplinger TaxCut and Intuit's Quicken TurboTax for your personal tax preparation, this year won't be any easier. Not only have perennial competitors TaxCut and TurboTax upgraded, but now Microsoft has jumped into the fray with TaxSaver—significant news in this traditionally limited field. And 2nd Story's TAXACT is back for a second year.

In this year's roundup, both TaxCut and TurboTax earn our Editors' Choice. Each is an excellent, mature product. TurboTax has a slight usability edge, but Block is making some enticing financial offers that taxpayers getting refunds should consider: With the company's Electronic Refund Advance program, a \$19.95 fee gets you your refund within 48 hours. And Block's Refund Rewards can be used for a large variety of discounted services and products: \$500 off a GM car, for example, and 10 percent off nearly anything at RadioShack.

Among the established packages, there's been little innovation (and little real need for it), save for some interface tweak-

ing, minor operational changes, and, of course, the incorporation of tax law changes. Instead, the biggest news this year comes from where you'd probably expect it: the Internet. More Americans than ever are expected to file their returns electronically—up over 30 percent to 23.6 million out of 125.1 million projected tax filers, according to the IRS. In addition, on-line tax preparation is gaining momentum (see our sidebar "E-Prep and E-Filing Get Easier"). Intuit's WebTurboTax (www.webturbotax.com) returns, and Block Financial will compete with a similar service hosted at its own site (www.hrblock.com) and at Microsoft's personal finance site (moneycentral.com).

The mechanics of tax-preparation software remain pretty much the same: You can let an "interview" walk you screen by screen through your return, or you can enter your tax-related information directly on the forms. Once your return is completed, each program looks for things you forgot or entered incorrectly and helps you plan for the next tax year. When you're done, you can print or electronically file your return.

Do tax-prep programs sound like a good deal? They are, especially considering that none costs more than \$50—and most are much less, with the ubiquitous rebates. If you're doing your taxes manually, using one of these programs is worth a try, even if only to find legitimate deductions you could be claiming.

Kiplinger TaxCut Deluxe Multimedia



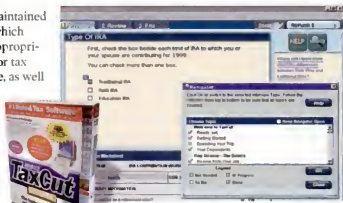
This year's tax packages are all of such high quality that it's tough to choose among them. So to get your business, Block Financial Corp. is aiming where you'll appreciate it most: your wallet. For one thing, those who buy Kiplinger TaxCut Deluxe Multimedia get free access to all state editions. And as with the online version of TaxCut, you can opt to receive refunds immediately through a program called Electronic Refund Advance (\$19.95) or to receive refunds on a MasterCard debit card with incorporated discounts.

We like the changes made to TaxCut's

interface this year. It's never been difficult to navigate the program, but in past years we occasionally found ourselves at a loss for the next step. That was rarely a problem this year. TaxCut also offers a few extra search functions.

The program has maintained the Shoebox feature, which helps you locate the appropriate form or schedule for tax documents you receive, as well as RapidFind, an exhaustive index of all data in the program. TaxCut's IRS instructions, Kiplinger Tax Tips, and financial planning resources are not

context-sensitive, but the body of help included is roughly comparable to the help TurboTax provides. Worksheets and in-progress audit flags enrich your tax-prep machinations.



TaxCut's review/audit process covers the basics but doesn't go beyond them. And though TaxCut is a workhorse when it comes to preparing your return, the only real planning tool is Tax Estimator, for analyzing alternative tax scenarios. Still, TaxCut's a top-notch tax-preparation program that moves you easily through a decidedly unfriendly process.

\$25 street after rebate. Block Financial Corp., 800-457-9525, www.taxcut.com. ♦♦♦♦♦

Microsoft TaxSaver Federal Deluxe

Microsoft TaxSaver Federal Deluxe is an exceptionally strong first-year effort. But the program has a serious omission: TaxSaver doesn't do state taxes, only federal. Without this deficit, the program might have leapfrogged over its competition.

In look and feel, TaxSaver is almost identical to its sister product, Money—and works just as well. Better than any other product this year, TaxSaver simultaneously displays all of the pieces you need: a navigational outline, input screens, and context-sensitive help and guidance tools. FAQs provide answers to common questions, and Advise Me drills down on complex topics. In Interview mode, you can



view the form you're working on in a split-screen format.

The Interview's preparation narrative is as thorough as that of any TaxSaver's competitors, and the Help resources match or exceed the others'. Beyond the standard IRS and interpretive help, TaxSaver's resources include J.K. Lasser's *Your Income Tax* and Jeff Schnepfer's *How To Pay Zero Income Taxes*. And the standard review/audit feature is supplemented

by an excellent planning section, quite nearly as good as that of TurboTax, that compares your return with U.S. or

state averages in areas such as income, deductions, and interest; forecasts your future tax obligations; and calculates upcoming estimated tax payments.

Microsoft Money users in particular should consider trying TaxSaver. It will be an even stronger contender in the future when it adds state tax modules.

\$25 street after rebate. Microsoft Corp., 800-426-9400, www.microsoft.com. ♦♦♦♦♦

Quicken TurboTax



Like TaxCut, Intuit's Quicken TurboTax has a less cluttered interface this year. We didn't often find it distracting in the past, but the new sparseness may be less confusing during those marathon tax sessions.

In general, TaxCut and TurboTax are well matched when it comes to the tax-preparation process itself, but no one integrates tax preparation and personal finance as thoroughly as Intuit does.

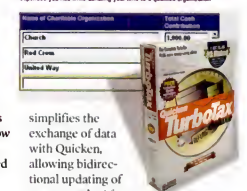
TurboTax's Navigator doesn't break down and track the Interview process as well as either TaxCut or TaxSaver, but that's the only negative in the preparation process. The product's Auditor sets it apart from TaxCut. Auditor checks for data entry errors and audit triggers, pinpoints possible overlooked deductions, compares your return with national averages, and offers personalized tips for tax savings next year.

TurboTax's Quicken TaxLink



Cash, Check, or Credit Card Contributions

Enter all cash contributions you made during 1999 including any out of pocket expenses you had while donating your time to a qualified organization.



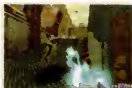
simplifies the exchange of data with Quicken, allowing bidirectional updating of your records. After your return is completed, a separate planning section lets you plug in numbers and evaluate your year 2000 taxes.

Intuit has again delivered an excellent

QUICK CLIPS

Unreal Tournament

The most well-rounded first-person action game on the market, Unreal Tournament is perfect for anyone hooked on death-match virtual combat. Spectacular graphics and a host of extra features, such as detailed statistics tracking, five killer game modes, and an included level-editing program, make this game an action fan's dream come true.



Although the graphics don't quite match Quake III Arena's advanced 3-D splendor, Unreal Tournament is a better package. Whether you play online or alone, you'll have a hard time tearing yourself away from this game.—*Michael E. Ryan*
\$40 street. GT Interactive, 800-610-4847, www.gtgames.com. ♦♦♦♦♦

Quake III Arena

Game fans who are not overly concerned with the extra combat modes and statistics-tracking capabilities offered in Unreal Tournament will likely be blown away

by Quake III

Arena. The

spectacular

graphics and

fast, furious

game play make this title a joy for death-match fans. If you simply crave the frenetic action of previous Id Software titles and the absolute latest in 3-D graphics technology, Quake III Arena is the one for you. But for those game fans who long for a more complete and well-rounded experience, Unreal Tournament has a slight edge.—*MER*
\$50 street. Id Software Inc., 310-255-2000, www.quake3arena.com. ♦♦♦♦♦



Midnight Play

A popular children's picture book makes the leap to CD-ROM with Midnight Play, an interactive playground based on the characters drawn



by artist Kveta Pacovska. A theater's cast of performers magically comes to life at midnight, and you direct the action. There are

no text or verbal messages in the game; players simply click around to control dancing clowns, paint pictures, and romp through interesting environments. The artwork may be a bit sophisticated for younger kids (the box says 6 and up), but the activities and sounds are mesmerizing.—*Michael Steinhardt*
\$20 street. Simon & Schuster Interactive, 212-698-7000, www.ssiinteractive.com. ♦♦♦♦♦

WHAT THE RATINGS MEAN

- ♦♦♦♦♦ - EXCELLENT
- ♦♦♦♦ - VERY GOOD
- ♦♦♦ - GOOD
- ♦♦ - FAIR
- ♦ - POOR

Microsoft Links LS 2000

Last year's Links LS was a solid golf game, although it lagged behind Activision's Jack Nicklaus 6: Golden Bear Challenge. Now marketed by Microsoft, the game is even better, with 35 game styles, five new courses, and four ways to control your golfer's swing. The graphics have been enhanced, and the game play has been streamlined for newcomers without sacrificing the realism of the higher skill settings. Links LS 2000 is at least as much fun as the Nicklaus title—good news for fans of this long-running series.—MER
\$49.95 list. Microsoft Corp., 800-426-9400, www.microsoft.com. ●●●●

Compton's Learning Astronomy

Whether you're an armchair astronomer or a budding NASA specialist, Compton's Learning Astronomy offers a huge reference collection to



put the universe in context. From expert-narrated QuickTime movies to definitions from *The Penguin Dictionary of Astron-*

omy, this program offers insight into celestial history, and detailed graphics draw you into myriad perspectives of planets, constellations, and galaxies. Beginners might find the control panel intimidating at first, but both advanced astronomers and novices will return to this program.—Suchitra Gururaj
\$30 street. The Learning Company, 800-821-7841, www.learningco.com. ●●●●

Encarta Africana 2000

With high-quality articles, rich multimedia content, and an intuitive interface, Encarta Africana 2000 is a top-notch resource on the history and culture of Africa and people of African descent. Africana 2000 supplements many of its articles by adding Web links and information such as historical documents and wire service stories. New features include 500 additional articles, a chronology of the civil-rights movement, and expanded multimedia content—including a time line of African-American music.—Nancy Sirapany
\$69.95 list, \$30 rebate. Microsoft Corp., 800-426-9400, www.microsoft.com. ●●●●

Who Wants to Be a Millionaire

This game reproduces the excitement of its namesake ABC TV show. A virtual Regis Philbin, along with the Fastest Finger Round, three lifelines, and the music and sounds of the TV show make you feel as if you're really sitting in the Hot Seat. If you can't get enough of "Millionaire" on the tube, or if you just enjoy playing along with quiz shows, this game is an excellent choice. The only things missing are commercials—and the cold, hard cash.—Craig Ellison
\$19.99 list. Disney Interactive, 818-553-5000, www.disneyinteractive.com. ●●●



AFTER HOURS TAX-PREPARATION SOFTWARE

update to TurboTax. But the product doesn't have a whole lot of wiggle room. TaxCut is just as easy to recommend, and TaxSaver is a strong contender, our only caveat being the lack of a state tax module.

\$30 street. Intuit Inc., 800-446-8848, www.turbotax.com. ●●●●

TaxACT '99 Deluxe

2nd Story Software, the only company in this group to offer absolutely free tax preparation (and paper) filing, is back in the tax game for a second year. In your hurry to grab the biggest, baddest tax program, don't overlook this gem in the free.

TaxACT Standard Edition is free for the download but allows one return only. The Deluxe edition is less of a bargain. At \$9.95, it's the lowest-cost deluxe product in the roundup, but its features are more on a par with those of the basic versions of Kiplinger TaxCut and Quicken TurboTax (\$8 and \$10 after rebates, respectively). State returns are \$12.95 each, eliminat-



MORE ON THE WEB: For more details about online tax preparation and e-filing, visit the Web sites listed in Sitefinder (page 000). And be sure to check our own Web site, www.pcmag.com, for expanded coverage of online tax-preparation tools.



Your medical and dental expenses that exceeds \$3,000 or the total expenses you paid (less any reimbursements) for you or your dependents

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ing any real cost savings versus the other deluxe offerings.

TaxACT's weakest link is its help and guidance features. The Q&A interview seems sparse compared with programs like TaxCut, though TaxACT covers roughly the same amount of territory; you just have to work a little harder to get through it. And the program's review process—though it adequately covers the basics, digging up errors and omissions and suggesting tax-saving ideas—is not very well fleshed out yet.

TaxACT shines in its simplicity, though. The TaxACT interface is clean as a whistle without being spartan. Minimalists who don't need guidance and don't want any extras should consider downloading the free version.

\$9.95 direct. 2nd Story Software, 800-573-4287, www.taxact.com. ●●●

E-Prep and E-Filing Get Easier

Someday soon, those who use desktop software for tax preparation and print their returns may be in the minority. Electronic filing and Web-based tax preparation keep growing, and with good reason: With e-filing, you use less paper, your returns are far more accurate, and you get faster refunds. Again this year, each reviewed software product offers e-filing. 2nd Story's TaxACT Deluxe charges \$7.95 per return, and Kiplinger TaxCut Deluxe Multimedia and Quicken TurboTax users can e-file free with a mail-in rebate. Microsoft TaxSaver Federal Deluxe users get free e-filing outright.

There's news in online tax preparation too. Web-based tax prep obviates installing

an application you use only once. And once your information is on the Web, you'll be able to access it from anywhere. Last year, Intuit was first out of the gate with WebTurboTax (www.webturbotax.com), a browser-based application designed to look and operate identically to its software-based counterpart. WebTurboTax will be back this year, but its pricing was not yet determined at the time we wrote this. Now Block Financial Corp. is offering an online version of TaxCut (www.hrblock.com). Users are charged for the service only if they actually e-file the return (\$9.95 for federal returns and \$4.95 for state forms; Form 1040EZ is free). Oddly, Microsoft will cobrand the Block offering on its own MoneyCentral site (moneycentral.com). As for TaxACT, 2nd Story Software has no plans to offer an online version of the program.—KY



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PC Computing Magazine

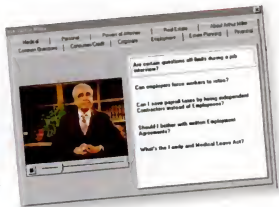
Smart Security

Do you keep your passwords on scraps of paper, or forget them altogether? The **PubliCard Smart Passky** is a smart-card reader that safely stores your log-on info for password-protected URLs, like auction or e-mail sites, as well as confidential data such as your credit card number—with just one password to remember. Minor drawbacks are a slightly quirky interface and a menu that is always on top.—**Jeremy A. Kaplan**

\$59.95 list. PubliCard Inc., 212-489-8021. www.publicard.com. ●●●●

Lay Down the Law

With a revamped interface, a free copy of *The Complete Idiot's Guide to Wills and Estates*, and 37 new documents covering estate-planning, credit-card, and Medicare issues, **Quicken Family Lawyer 2000 Deluxe** should make a useful addition to your legal library. For additional questions, visit the video legal advisor, Harvard Law School professor Arthur Miller.—**Sharon Nash**
\$30 street. Broderbund Software/Learning Company, 800-395-0277. www.shopmattel.com. ●●●



Dancing Dolls

Barbie introduces us to five new friends in the **Generation Girl Gotta Groove CD-ROM**. Your kids create dance routines for the Generation Girls, but the process is awkward. The dance competition is a spectacle, though, with fantastic camera angles, special effects, and cheering fans.—**Sarah Pike**

\$35 street. Mattel Media, 888-628-8359. www.generationgirl.com. ●●●

Move Over, Clapper

The **X10 FireCracker** wireless computer interface kit takes home remote control to the 21st century. The inexpensive kit comes with a hand-held RF controller, a plug-in RF receiver module that doubles as an appliance controller, a lamp control module, and a tiny computer interface module. An easy setup gets you automating in minutes; just bear in mind that your PC always has to be on to control the lights.—**Jay Munro**

Free (plus \$5.90 shipping/handling). X10.com, 800-674-3044. www.x10.com. ●●●●



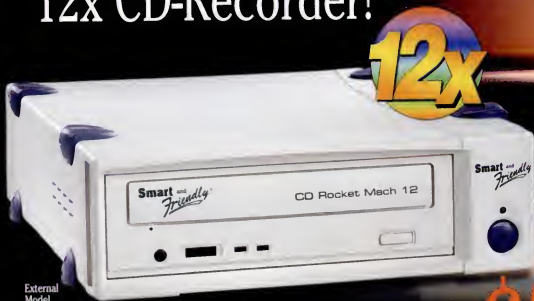
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Edited by Don Willmott



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Isn't that a Mac menu?
(American Library Association Store catalog.)

Gateway recalled this squeezable toy, explaining: "Parents have alerted us that small children can tear or bite off parts of the stress cow." Geez. Those kids sound stressed!



Product Recall
of Gateway™
Stress Cow

"Before the Web existed, it was very hard to explain what the Web was."

—Tim Berners-Lee, inventor of the World Wide Web

COMPUTER ENDS RANGERS' WORLD SERIES HOPES

"Mike Munoz, a left-handed Rangers pitcher..., dropped a new computer on his foot, fracturing his toe. He was trying to get the computer out of its box, he said."

(The New York Times.)



FOR THE RECORD

A story on Page B1 Sunday on the use of Sonoma County library computers by patrons to view pornography incorrectly described the use of a computer at the Petaluma library by Jim Trumbel of Sonoma. He was not using it to view pornography on the Internet. The word "not" was inadvertently left out of the story.

The Press Democrat uses this space to correct errors that appear in the news columns. Please call the newsroom at 526-8585 to report errors.

Oops!
(Santa Rosa [California] Press Democrat.)

LET'S HAVE A CHAT

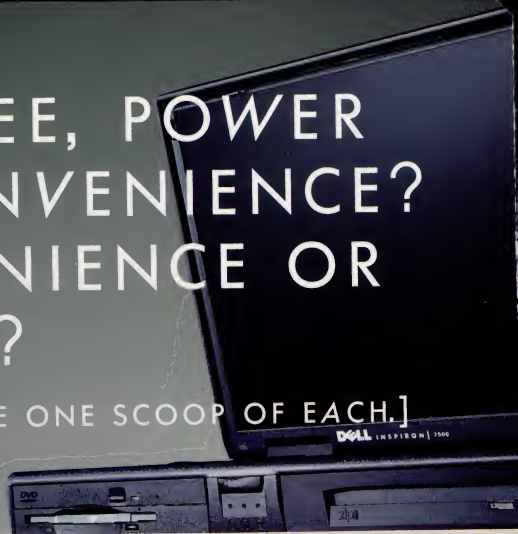
Tribal Voice's *Ultimate Chat Dictionary* includes these new acronyms for all you instant-messaging freaks out there:

BM—Blonde Moment
BRBIGGAT—Be Right Back I Gotta
Get a Towel
IHARIMT—I Have a Rumbly in My Tummy
JCVD—Jean-Claude Van Damme
MNC—Mother Nature Calls
RMH—Real Manly Hug
YYSSW—Yeah Yeah Sure Sure
Whatever

If your entry is used, we'll send you \$50 and a PC Magazine T-shirt. Send your entries to Backspace, PC Magazine, 28 E. 28th St., New York, NY 10016-7930 or via e-mail to don_willmott@zd.com. Winners this issue: D.C. Cassidy, Loren Kellogg, Robert Ostling, and Grete Pasch.

LET'S SEE, POWER OR CONVENIENCE? CONVENIENCE OR POWER?

[OH HECK, TAKE ONE SCOOP OF EACH.]



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